Welding Engineer

PRICE 35 CENTS

JULY, 1955

HI-AMP
WELDING PRODUCTS

Outstanding *by comparison*

Every manufacturer "makes the best"—that's his natural conclusion, but after all, it's the Welder who uses the product that decides which *really is* the best. With HI-AMP Electrode Holders, as well as all other HI-AMP Welding Products, we urge you to check "every claim made" for superiority, because if you do we are confident you, too, will find HI-AMP Products are *Outstanding by Comparison.*

Weld with Wagner

WAGNER MANUFACTURING CO. *inc.*, JACKSON, MISSOURI

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Weld with Wagner

WAGNER MANUFACTURING CO. inc., JACKSON, MISSOURI

OIL RESISTANT JACKET

(BUILT LIKE A TIRE TREAD)

PRODUCTION WELDING

FIELD CONSTRUCTION

BRIDGE WELDING

CAN'T SLIP

BELDEN NON-SLIP JACKET

DOES NOT SHRINK FROM ELECTRODE HOLDER

PIPE LINE

HEAVY INDUSTRIAL WELDMENT

JOB SHOP BOOTH WELDING

LONG FLEX LIFE

NO INDIVIDUAL COPPER STRAND IS EVER UNDER TENSION WITHSTANDS OVER 50,000 FLEXES

WELDING CABLE

by Belden

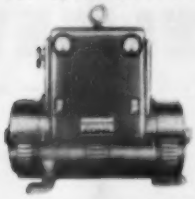
WIREMAKER FOR INDUSTRY SINCE 1902

2-18

Try! Compare

. . . the new **HOBART Arc Welders**

. . . and you'll see why you get more actual benefits in dollar savings and INCREASED PROFITS! HOBART'S outstanding design and special features bring higher performance, faster welding and lower cost operation in a compact and easy to move unit.



For Automatic Welding

Bantam Champ

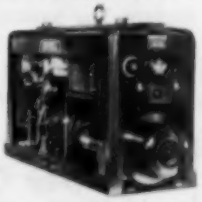
AC Transformer Welders

For Faster Production

Hobart welders will do your production work better and faster. They're available in 200, 300, 400 and 600 ampere sizes to do any job—light or heavy. An on the job comparison will prove their value . . . job after job you'll see Hobart outperform other welders, saving time and cutting production costs.

300 amp. Electric Portable

300 amp. Gas Engine Drive



250 amp. "Pipeliner"

200 amp. Gas Engine Drive

For Repair and Maintenance

For repair and maintenance work Hobart offers a wide range of welders in electric motor driven or gas engine drive—air or water cooled—portable or stationary. Now you can have AC welding and AC power for repair or construction jobs away from power lines—may also be used as an emergency power source. Find out how you can get better, lower cost welding by mailing the attached coupon . . . no obligation, of course.

HOBART electrodes

Try them . . . a comparison will prove you can get more top quality welding per day. Hobart electrodes are made for every application of AC or DC welding. Tell us the type work you do and we'll send samples for you to try!

HOBART TROY OHIO **WELDERS**

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"One of the world's largest builders of arc welding equipment"

CLIP THIS COUPON AND MAIL TODAY!

HOBART BROTHERS CO., BOX U-75, TROY, OHIO. Ph. 21223

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☐ Combination Welder or 110 v. AC Power

☐ Powromatic for Automatic Welding

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HOBART WELDERS, ELECTRODES

CESCO RIGHT... before your Eyes!

DURABLE, LEAK-PROOF WELDING HELMETS

No. 401-2 with Lift-Front Lens Holder

• This is a seamless fiber helmet which permits easy layout and inspection of work. It features the #2 streamlined lift-front lens holder with shock-absorbing action. It has every safety and comfort feature. The helmet has an adjustable chin rest and form-fitting adjustable headgear with leather sweatband.

No. 401-7 with Stationary Lens Holder

• Here is an extremely popular all-purpose helmet which meets the safety and comfort requirements of most production and maintenance welding. It is equipped with a #7 leak-proof, telescoping lens holder. Comfort is provided by an adjustable chin rest, form-fitting headgear and a leather sweatband.

Other CESCO Welding Helmets

CESCO makes a wide variety of welding helmets to meet every requirement. These include Fiber Glass Helmets, combination Hat-n-Shield and Air-Fed Helmets. These quality products are backed by years of field experience.

When you buy CESCO equipment you know it is *Right... before your Eyes!*

Send TODAY
for CESCO literature and the name of your CESCO safety equipment distributor

CHICAGO EYE SHIELD COMPANY • 2330 Warren Boulevard, Chicago 12, Illinois

CESCO FOR SAFETY

OFFICES IN: Atlanta, Birmingham, Boston, Buffalo, Cincinnati, Cleveland, Columbus, Dallas, Detroit, East Orange, Houston, Indianapolis, Kansas City, Knoxville, Little Rock, Los Angeles, Mexico City D. F., Milwaukee, Montreal, Peoria, Philadelphia, Pittsburgh, Salt Lake City, San Francisco, Spokane, St. Louis, St. Paul, Toledo, Tulsa, Wichita

Welding Engineer

JULY, 1955
Vol. 40—No. 7

A MAGAZINE OF JOINING AND SEVERING OF METALS

America's pioneer publication which, combined with The Acetylene Journal, has been devoted to the interest of the welding and allied industries since 1898

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HEADGEAR
Part No. 62

This headgear has been furnished on all Jackson fiber glass helmets and remains available.

It permits fitting to the head in ⅛" steps, clearly marked in hat sizes for quick, yet firm adjustment before putting the helmet on.

Now You Have the Choice of All Jackson Welding Helmets at No Extra Cost, with the...

NEW Jackson ADJUST-O-LOK

It *adjusts* quickly, *locks* firmly *after* putting the helmet on. Its fine adjustment permits tightening or loosening while wearing the helmet, as you may require. The large, winged knob is easy to handle, even while wearing gloves.

The mechanism, entirely enclosed, smooth against the head, has a minimum of moving parts. Both *knob* and *gear* are of Nylon, lightweight, and non-conductive.

This new ADJUST-O-LOK Headgear is interchangeable with the No. 62 headgear, attaches to the same Jackson friction pivots, adjustable from the outside while in use. Plastic straps, of a new formula, are stronger, self-extinguishing. They're easy to clean. Cork-padded sweatband snaps on quickly, is inexpensive to replace.

CHOOSE FROM THESE JACKSON FIBER GLASS HELMETS . . .

FIXED-FRONT type H-1
Available with metal lens holder or with the new, high-impact plastic lens holder as shown above.

LIFT-FRONT type H-2
permits work inspection without raising entire helmet. Lens holder of high-impact thermosetting plastic has hinged door held by coil springs. Cover glass protects filter lens; another glass protects the eyes when front is raised.

FIXED-FRONT type H-3
of narrow-front design. All parts are interchangeable with type H-1. With metal or plastic lens holder.

LIFT-FRONT type H-4
This narrow-front, fiber-glass helmet has the same parts as type H-2, including plastic lens holder with hinged door for quick work inspection.

—WITH EITHER ADJUST-O-LOK OR HEADGEAR NO. 62

Also New . . .
HANDSHIELDS H-5 and H-6

They consist of the same fiber glass shells as Helmets H-1 and H-3 respectively, and are fitted with new plastic insulated fixed-front lens retainers and vulcanized fiber handles.

JACKSON
PRODUCTS, INC.
WARREN · MICHIGAN

SOLD THROUGH DISTRIBUTORS AND DEALERS THROUGHOUT THE WORLD

—The National Supply Co.

WELDOR is shown welding steel pipe to headers during construction of artificial icing system at Hamtramck, Mich., skating rink. The rink was completed in three weeks

—Linde Air Products Co.

MIG weldor fuses a crack in an irrigation-pump impeller. Periodic measurements during welding must be made between balls on the pegs to control distortion

News

Welded rink extends ice skating season

Chilled brine, circulated through welded steel pipe, keeps ice frozen on the skating rink at Hamtramck, Mich., near Detroit, through the fall and winter.

Approximately 9½ miles of 1-in. steel pipe criss-cross the 85 by 185-ft rink, carrying the chilled brine which freezes the covering sand. This, in turn, freezes water sprayed above it. Ice is kept at any desired hardness by a thermostat.

Arc and gas-welding were used to bind the lengths of pipe to each other. Installation of the system was finished by a seven-man crew in three weeks.

* * *

New AWS Section planned in Corpus Christi

Formation of a new section of the American Welding Society in Corpus Christi, Texas, was the subject of a planning meeting held June 2.

* * *

Metal & Thermit to build office building

Metal & Thermit Corp., New York City, has announced plans for construction of a general office building at Woodbridge, N. J. It will be adjacent the company's research laboratory.

The new building, expected to be finished by April, 1956, will house the operating departments of the company and its affiliates in the New York City metropolitan area, including sales headquarters for the northeastern area. Executive offices will remain in New York City.

* * *

Arizona distributor holds 3-day clinic

A three-day welding clinic was recently held by Dye Oxygen Co., Inc., Phoenix, Ariz. Approximately 450 persons attended the event held at the plant, 3332 W. McDowell Rd.

The program included demonstration and discussion of new automatic-welding equipment, electrodes, semi-automatic welding processes, welding stainless metals, brazing dissimilar metals, industrial and farm hard-facing.

As a result of the favorable response, the firm intends to make the clinic a yearly event.

* * *

Alcoa plans Davenport rolling mill

The Aluminum Co. of America, Pittsburgh, Pa., has announced plans to build a hot sheet rolling mill at its Davenport, Ia., works. The mill, said to be the widest of its type ever planned for the aluminum industry, is part of an expansion program started in 1952.

Mig welding repairs cracks in pump impellers

Cracks in pump impellers at the Tracy Pumping Plant in California's Central Valley Irrigation project are repaired by Mig (metal inert-gas) welding.

Flexibity of this process makes for easy repair without impeller removal, and for slag-free deposits with a minimum of spatter, it is claimed.

The pumping plant has six vertical-shaft, single-suction pumps. During operation the 20-ton, manganese-bronze cast impellers occasionally crack in the vane fillets and in adjacent, previously repaired areas. To date, 125 repair-welds have been made, ranging in size from sand inclusion spots to large cracks.

* * *

Belden now supplies cable in one piece

Belden Mfg. Co., Chicago, recently began supplying continuous one-piece lengths of all its welding cable products. This policy applies to the newly adopted cable packages as well as to longer coils and reels.

* * *

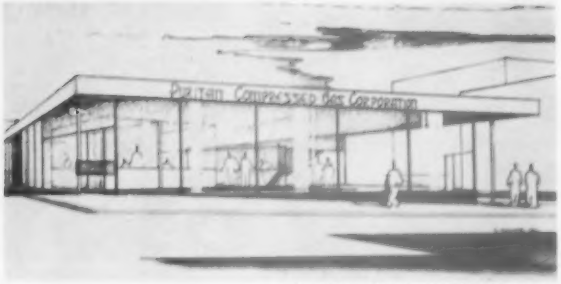
Victor opens new branch store on West Coast

A new branch store was opened in Stockton, Calif., by Victor Equipment Co. The new store, at 1100 East Main St., is equipped to supply the Stockton area with welding and cutting equipment. It also has repair facilities.

Richard Labagh has been named district manager of the Sacramento-Stockton areas. Neal Holmes has been named branch manager of the new store.

NEWS

from page 5



—Puritan Compressed Gas Corp.

WELDING supply store, shown in sketch, is under construction at Kansas City. Building will include sales offices, display rooms and equipment at one location

—Selas Corp. of America

ARCHITECT'S sketch depicts new plant being built at Dresher, Pa. The building is designed to complement its rural surroundings

Puritan Gas builds new Kansas City store

The Puritan Compressed Gas Corp., Kansas City, is building a new welding equipment store at the southeast corner of 20th and Walnut St.

The air-conditioned building will contain 7,600 sq ft of space, incorporating sales offices, display rooms, welding supplies and equipment under one roof. Improvements in customer service prompted the new addition.

The firm was a pioneer in the manufacture and distribution of gases in the Midwest. Lee Page is general manager of the Industrial Division scheduled to occupy the building September 1.

* * *

Philips plans X-ray schools for fall

Two X-ray diffraction schools will be held this fall by the Research and Control Instruments Div., North American Philips Co., Inc., Mt. Vernon, N. Y.

The first series of sessions will be at the Sir Francis Drake Hotel, San Francisco, Sept. 26-30. The second series will be at the Hotel Knickerbocker, Chicago, Oct. 10-14.

* * *

Teer, Wickwire Co. buys Lindberg Air Division

Teer, Wickwire and Co., Jackson, Mich., (producer of machined parts for the automotive industry) has announced purchase of the Lindberg Air & Hydraulic Cylinder Div. of Lindberg Engineering Co., Chicago.

The purchase covers stock, machinery, designs and development work. The firm will continue to market cylinders under the Lindberg name.

The new name will be Lindberg Air & Hydraulic Div., Teer, Wickwire and Co.

* * *

Automatic plating plant feature of new laboratory

The International Nickel Co. has established a new plating lab at its Bayonne, N. J., research laboratory. The main feature of this new lab is the fully automatic, pilot plating plant.

This plant is said to permit testing of new plating processes and metallic coatings under simulated industrial conditions.

The lab is equipped for research in all phases of the plating. Bayonne research has included development of high nickel alloys, welding electrodes, nickel plating and nickel-clad materials.

* * *

Burdett increases facilities in Mansfield, Ohio

The Burdett Oxygen Co., Cleveland, Ohio, has completed a new branch plant in Mansfield, Ohio. This new building at 45 E. Longview Ave., replaces the firm's former location at 210 N. Diamond St.

The modern one-story building has 7,200 sq ft of working space. Features of the plant include liquid-oxygen vaporizing and pumping equipment, a cylinder maintenance department, display room and a warehouse. Mr. William A. Kaiser is manager of the Mansfield branch.

Selas Corp. to build new plant in Pennsylvania

Construction has started on a new plant for the Selas Corp. of America, Philadelphia, Pa., manufacturer of brazing and other heat-processing equipment. The plant is being built on an eleven-acre site at Dresher, Pa., 22 miles north of downtown Philadelphia.

The move, dictated by increased space requirements, will give room for future expansion. Three buildings will house research and development, production, and administrative operations. Full production is planned for early in 1956.

* * *

A. O. Smith awards welding certificates

The first customer-personnel group has been awarded certificates by A. O. Smith Corp.'s Welding Institute in Milwaukee. The two-week course is believed to be one of the most comprehensive in welding undertaken by a manufacturer. It included advanced work in manual, automatic and semi-automatic welding.

The Institute, founded in 1954, has as its objectives, improvement of welding quality, reduction of costs and availability of welding know-how to its customers and operating divisions.

* * *

Lincoln Electric executive receives alumni award

A. F. Davis, vice-president and secretary of The Lincoln Electric Co., Cleveland, Ohio, has received the "Distinguished Alumnus" award from

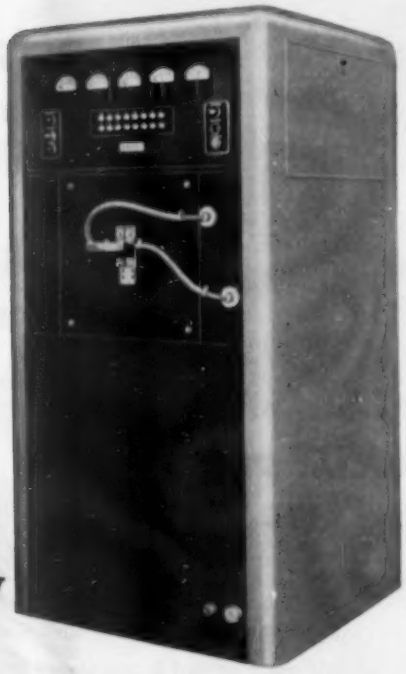
(Continued on page 78)

To help improve induction heating applications, Lindberg engineers have spent two years developing equipment for M-G set frequencies of 1 kc., 3 kc. and 10 kc. This equipment is now available to you.

This development has also produced many advanced design features that are incorporated in control and heating stations used in connection with motor generator equipment.

Generators are available in power outputs from 30 kw. to 1250 kw.

Lindberg engineers are now equipped to solve your metal heating problems using optimum frequencies for specific applications from 60 cycles upwards. For information consult your nearest Lindberg field office or write for Bulletin No. 1460.



The High Frequency Division of Lindberg Engineering Company announces a complete line of MOTOR GENERATOR EQUIPMENT for all Induction Heating Applications

HIGH FREQUENCY DIVISION
Lindberg Engineering Company
2477 W. Hubbard St., Chicago 12, Illinois

United's
PHOSONS & SILBONDS
Produced Under One Control

...In Wire, Rod, Strip, Powder and Finished Preforms for your Brazing Alloy Requirements

Why are PHOSON and SILBOND "Natural" Brazing Alloy Choices?

Because, despite their remarkably low brazing temperatures, Phoson and Sil-Bond are able to make high strength, ductile, leak-proof joints. And they flow so quickly and freely, brazing time is at a minimum.

Because, Phoson and Sil-Bond are produced in one United Wire mill from component elements through all production steps including alloying, casting, rolling, wire drawing, coiling straightening and even, when required, into preformed shapes to your specifications!

Ask for the new Phoson Folder

One central, responsible control is your assurance of products to consistent high quality and of prompt delivery promises maintained.

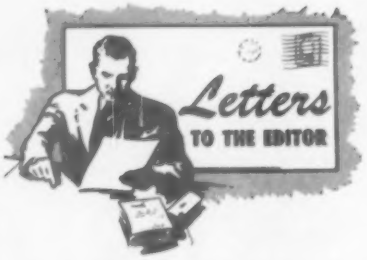
For Dependable Low Temperature Brazing You Use The Finest Alloys When You Use PHOSON and SILBOND

Wherever you join metals make them

UNITED WIRE
& SUPPLY CORPORATION
PROVIDENCE 7, RHODE ISLAND

Permanently United

Offices in Principal Cities
SEE YOUR UNITED WELDING SUPPLY DISTRIBUTOR



Letters should be addressed to: The Editor, WELDING ENGINEER, 12 E. Grand Ave., Chicago 11, Ill. No letter will be published unless signed, but your name will be withheld if you request.

Liked editorial

Dear Sir:

I never fail to read your editorials. I was particularly impressed by "Roadblocks to welding use" which appeared on page 15 of your December issue.

It's high time that those in the welding industry fight those who block the progress and growth of welding.

More power to you on your courage to stress editorials with teeth. Let's hope to hear more from others in the welding industry who will have equal courage to stand up and fight.

Abelardo B. Escaño
Hijos de F. Escaño, Inc.

* * *

Author speaks

Dear Sir:

I have just received my copy of your May issue and was very pleased with the way you presented my article "How we run a welding clinic." Many thanks for your fine cooperation.

May I also congratulate you on your becoming owner and publisher of your fine magazine.

Al Earlbeck
Earlbeck & Landrum, Inc.

* * *

Early history

Dear Sir:

I have just written a letter to Bill Sparagen on his retirement as editor of *The Welding Journal*.

The writing of this letter to Bill has focused my attention on the fact I had not written you on your acquisition of the WELDING ENGINEER. I can assure you it was not an oversight, but just plain procrastination.

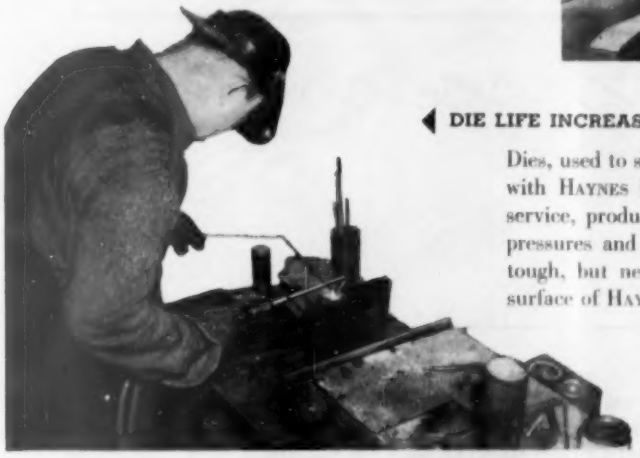
I recall Charlie McCune telling me how he worked with Mackenzie (*the late L. B. Mackenzie*) to launch the WELDING ENGINEER, which preceded *The Welding Journal* by

(Continued on page 13)

Hard-Facing Helped Here...it Can Help You Too!

LIFE INCREASED 400%

Hard-facing these entry guides with a wear- and heat-resistant HAYNES STELLITE alloy increases their service life from 4 to 5 times. Unprotected guides failed after handling only 40 tons of hot steel bars, while the ones protected with HAYNES STELLITE alloy handled up to 200 tons. The guides are subjected to continual abrasion and heat from the hot steel passing through them.



DIE LIFE INCREASED 500%

Dies, used to shape refractory tile, last 5 times longer when hard-faced with HAYNES STELLITE alloys. Hard-faced dies have given 10 years' service, producing up to 500,000 tiles. The dies have to resist high pressures and abrasion from dry press operations. Unfaced dies are tough, but need the wear-resistance gained from a hard, protective surface of HAYNES STELLITE alloys.

AN ALLOY FOR EVERY JOB

There are 14 different HAYNES hard-facing alloys. Some are hard and abrasion-resistant, some are tough and ductile, capable of withstanding the shock of severe impact; others give extraordinary service under conditions of corrosion, erosion, and heat. Descriptions of each alloy and procedures for applying it are included in the booklet, "HAYNES Alloys Hard-Facing Manual." Write today for your free copy.

HARD-FACE AND SAVE WITH

HAYNES *alloys*

Trade-Mark

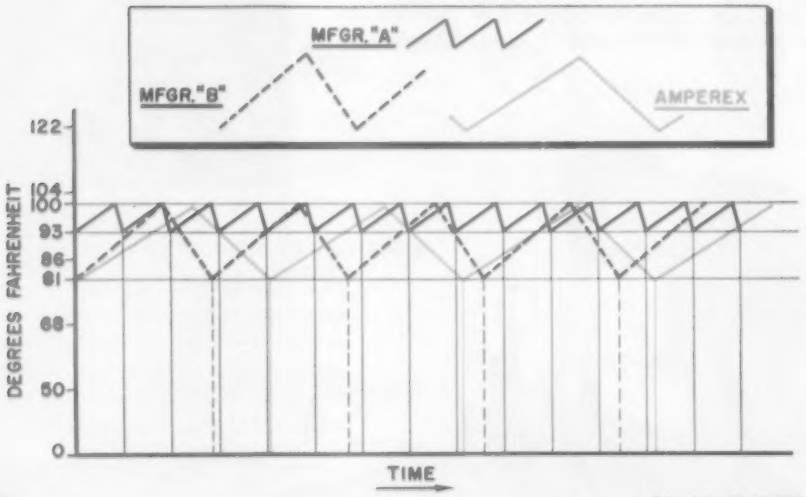
Hard-facing products made from cobalt-base alloys, nickel-base alloys, iron-base alloys, and cast tungsten carbide in the form of tube rods and coils.

"Haynes" and "Haynes Stellite" are registered trade-marks of Union Carbide and Carbon Corporation.

Haynes Stellite Company
A Division of
Union Carbide and Carbon Corporation
UCC
General Offices and Works, Kokomo, Indiana
Sales Offices
Chicago — Cleveland — Detroit — Houston
Los Angeles—New York—San Francisco—Tulsa

The PRACTICAL SOLUTION To Thermostatic Control of Ignitrons by Amperex®

THERMOSTAT OPERATION UNDER IDENTICAL SERVICE CONDITIONS



NOTE THAT THE AMPEREX THERMOSTATIC CONTROL GIVES SAME WATER SAVING SERVICE WITH MINIMAL SWITCHING. CUTS DOWN MAINTENANCE ON SOLENOID VALVES OR OTHER CONNECTED COMPONENTS.

RELATIVE NUMBER OF OPERATIONS	
A	72
B	32
AMPEREX	20

COMPARE the frequency of thermostatic operation of three ignitrons under the same load conditions, shown in chart above. The same "water-saver" efficiency was achieved in all three cases.

The advantages of thermostatic control are necessary in many cases. However, for practical reasons, the "water-saver" function should be fullfilled without unnecessary switching . . . and without unnecessary wear and tear on solenoid valves or circuit components. Unnecessary work imposed upon associated equipment usually results in high maintenance costs and/or service interruptions!

Field tests under actual severe load conditions have proven that the AMPEREX thermostatic control design is SIMPLE, PRACTICAL and DEPENDABLE.

Uses high-quality standard thermostats, electrically and mechanically interchangeable with the majority of other types.

AMPEREX
Thermostatically-Controlled Ignitrons are available in 3 types: 5551-A, 5552-A and 5553-B.

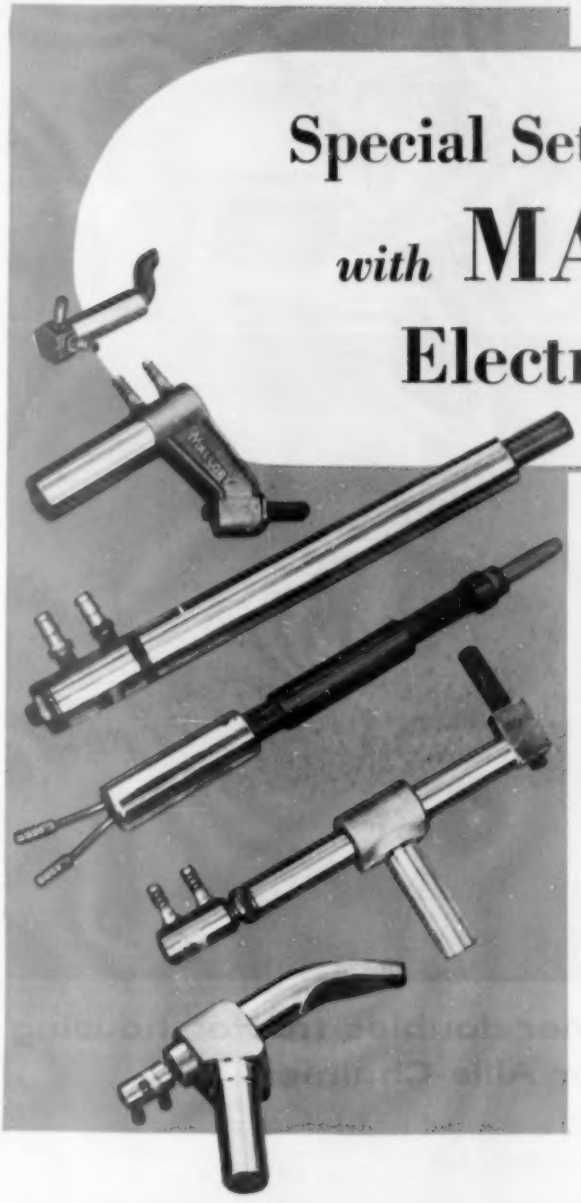
Other features of AMPEREX Ignitrons include the exclusive AMPEREX developed long-life ignitor made with new, refractory semi-conductor, detachable, heat-dissipating, heavy-duty anode connector and rugged stainless steel housing.

There's an AMPEREX distributor in all principal cities. Write direct to factory for data sheets and name of distributor nearest you.

Amperex ELECTRONIC CORP.

230 Duffy Avenue, Hicksville, Long Island, N. Y.
In Canada: Rogers Majestic Electronics Ltd.
11-19 Brentcliffe Road, Leaside (Toronto 17)

Special Set-Ups Made Easy...
with MALLORY Electrode Holders



BEFORE you go to the time and expense of getting a custom-made holder for a welding job, take a look at the variety of standard Mallory Electrode Holders. You can probably pick out the design your application requires ... at substantial savings in cost and delivery.

The most complete line in the industry, Mallory Electrode Holders offer many varied designs ... straight, offset, paddle type, swivel head, low inertia, universal and close-coupled. Light, standard and heavy-duty models are available for pressure ranges from under 100 lbs. to more than 6000 lbs.

By using these versatile holders in combination with the hundreds of different types of Mallory welding electrodes, you can assemble an almost unlimited variety of welding set-ups. Most welds in channels, or other hard-to-reach locations can be made with standard Mallory welding parts. And when your application poses problems outside of the range of standard models, Mallory engineers are well qualified to design special holders and electrodes for your individual needs.

Look through the Mallory Resistance Welding Catalog and pick out a series of holders that will equip your shop for the range of work you are doing. Your nearby Mallory distributor will be glad to give you a copy of this useful catalog and to help in your selection ... or you can get one by writing direct to Mallory.

Expect more...
Get more from

P. R. MALLORY & CO. Inc.
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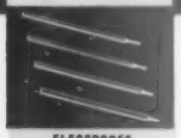

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P&H Welding Positioners have many exclusive features. Ask your P&H representative or distributor about them. Or write for our latest bulletin to the Welding Division, Harnischfeger Corporation, 4513 W. National Ave., Milwaukee 46, Wisconsin.

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LETTERS . . . . *from page 8*

several years. Furthermore, through Charlie's efforts, and the cooperation of Mr. Mackenzie, the WELDING ENGINEER carried the welding society's proceedings on its pages for almost two years before publication of the *Journal* in January, 1922.

Those were really tough times, for the welding process was not generally accepted as it is today.

In closing, I wish you every success in your venture.

James W. Owens
Beloit, Wis.

• • •

Another well-wisher

Dear Sir:

Better late than never! Just wanted to tell you I am very happy over the change in management—I believe WELDING ENGINEER will be a better magazine and do more for the welding industry. I believe you are thoroughly wedded to welding and that your chief concern is its proper growth.

I also believe that you appreciate the position of the distributor of welding supplies and that we can expect sound advice and factual statements.

J. M. Robinson
Robinson Welding Supply Co.

• • •

Weldors should unite

Dear Sir:

It was with much interest that I noted you had assumed command at WELDING ENGINEER. I wish you every success.

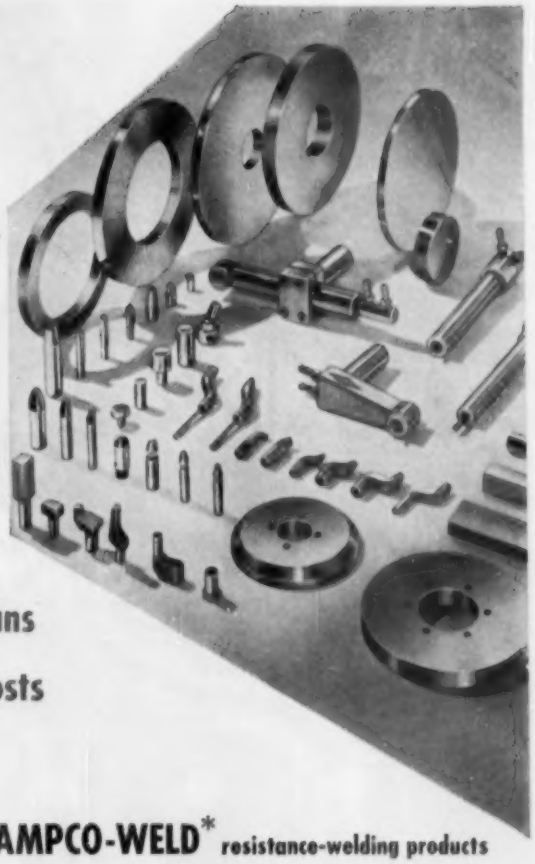
A letter in a recent issue seems to hit the point, regarding an organization to represent weldors. Some years ago a feeble effort was made along this line with poor results. I would like to see WELDING ENGINEER keep the ball rolling on this subject. I believe weldors are the best organized craft in the building and manufacturing trades but they are split and dispersed among the other craft unions.

I should think industry would back a move to reorganize weldors. I also think weldors should be licensed; the present system of testing is inadequate, and is possibly the reason weldors are not united.

Phillip M. Wilson
Childersburg, Ala.

• • •

While in France we consider it takes three generations to go from shirtsleeves to wealth, here in America, where accelerated speed is an important element of success, it takes but one generation to complete the same process.—Pierre Cartier



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All Ampco-Weld resistance-welding products meet or exceed RWMA specifications. Experienced engineering service is also available. Get what it takes to lower your resistance-welding costs — get Ampco-Weld, the best value for your resistance-welding dollar.

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The World's Largest Manufacturer of Arc Welding Equipment

ESTABLISHED 1916 **Welding Engineer** JULY, 1955

Dreams come true!

ALL of us enjoy dreaming of the future. Dreaming dreams we some day hope will come true.

Some dreams do come true, especially when they have, as their basis, reality. For they are not dreams, but ambitious thoughts. Such thoughts can be turned into actuality if those who dream them are willing to work hard enough to make them come true.

About eleven years ago a small group of welding distributors dreamed of forming an association for the industry. While their thoughts for the future were not all alike, these small groups, which met in Dayton, Omaha, Cedar Rapids and other spots around the country, crystallized their thinking on the idea of bettering the position of the welding distributor.

At Cedar Rapids and Philadelphia, their thoughts became lofty, and the goals they set for themselves were high.

The writer was a speaker at both of these meetings. On both occasions he predicted the future of the distributor as well as the future of the welding industry. Some of those present thought that he was dreaming, but it is apparent now that many of those dreams have come true.

AS MAY be seen by reading through the other pages of this issue, the welding industry has enjoyed two great meetings within the past several weeks. The distributors' meeting, held at the Edgewater Beach Hotel in Chicago, was outstanding. It was marred only by reservations that would not reserve, much to the disappointment of some of those who wished to attend and to the chagrin of those who came only to find no rooms available, despite confirmed reservations.

The character and quality of the meeting indicate that the welding distributors have come of age in the eight short years since their first big meeting at Philadelphia. There has been a tremendous change in the welding distributor, but his future looks even better.

THE SPRING welding meeting and allied industries' exposition of the American Welding Society in Kansas City was likewise tops in character and performance.

Those who scoffed at Kansas City as a "cow town" when it was mentioned as an exposition site had a happy awakening. Not only did they find the warmth and friendliness of the Midwest, but they also found the best welding show to date.

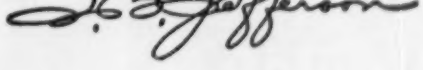
Those who have trekked miles through exhibit halls and more miles between exhibit halls in hotels trying to find welding exhibits will long remember the ease with which both these tasks were accomplished in the "heart of America."

The AWS has come a long way since WELDING ENGINEER asked the question back in November, 1944, "Should we stand alone?" with reference to a separate welding show. Ample evidence of another dream come true!

There is little doubt but what the annual meetings of NWSA and AWS will grow and be greater successes with each passing year. The welding society has already outgrown many of the cities that it once thought could house its meetings.

Let us hope that before too long these two organizations will be able to combine their annual functions so delegates will be able to take in the top welding activities in a short ten-day or two-week period without the need for traveling to far corners of the country.

It is just a dream, but one, I am sure, many hope will come true.



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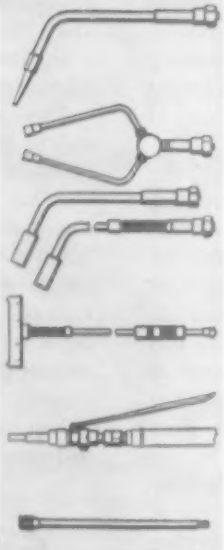

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AWS President J. H. Humberstone flame-cuts chain to signify official opening of the third annual welding show

THRONG pictured at president's reception and cocktail party is just part of total attendance

At AWS spring meeting and welding show . . .

Progress is keynote

By F. T. TANCULA

"WE STAND here amid progress and growth."

These words, taken from President J. H. Humberstone's welcoming address, best describe the American Welding Society's spring meeting and welding show held last month in Kansas City, Mo.

Progress was evidenced by the new equipment exhibited at the show and growth by the fact that more manufacturers participated than ever before.

Total registration at the spring meeting, conducted in the Hotel Muehlebach, was about 1,000 persons. About 7,500 persons passed through the doors of the Municipal Auditorium to see the Society's third annual welding show.

Good, although not perfect, weather, interesting technical sessions and conferences, and some fine social events combined to make a successful meeting.

The three welding conferences, conducted at the national level for the first time, attracted fair-sized crowds. Among the technical sessions, those on iron-powder electrodes and welding with a carbon-dioxide shield seemed to evince the greatest interest.

Interest Didn't Wane

It would be unfair, however, to disregard the others, for all were well attended. In fact, the morning sessions at the hotel were crowded throughout the last morning—when interest usually begins to wane.

Carbon dioxide as a shielding gas for semiautomatic and automatic processes was introduced by at least three firms exhibiting at the show. In addition, Gilbert R. Rothschild, of Air Reduction, Inc., presented a paper entitled "CO_2 Shielded, Consumable-Electrode Arc Welding."

Despite the many advantages of carbon dioxide as a shield in inert-arc welding, Mr. Rothschild cautioned his listeners as to its application. The use of a short arc is mandatory, he declared, to avoid excessive spatter. Research at Air Reduction has shown

JUST before greeting began, President Humberstone and J. J. Chyle, first vice-president, talk things over. Between them is Mrs. Humberstone; at right is Mrs. Chyle

RECEIVING line at reception included local Kansas City Section officers and their wives. They also played host at an outdoor western party and barbecue

And here's the show . . .

VISITOR to the welding show had this general view as he started down the Auditorium stairway

CARBON dioxide is used as shielding medium in automatic process displayed at press preview prior to opening of show

MANUFACTURER exhibited new magnetic-amplifier-controlled welder (see feature article on page 34 of this issue)

ANOTHER CO_2 welding process was displayed at this booth. Where CO_2 welding was displayed, there were the crowds

that use of reverse polarity decreases the amount of spatter.

This cheap, plentiful gas is not recommended for use on stainless, he said. In its research, Air Reduction used a mild-steel electrode wire and equipment now generally applied in other methods of inert-gas welding.

Powdered Electrodes

The iron-powder electrode received its share of attention in the paper presented by D. B. Howard, ACF Industries, Inc. In extensive tests conducted by his firm, the E6024 class was found to be about 36% faster in welding speeds than its conventional E6012 counterpart. But the burn-off rate of the iron-powder specimen was about 30% greater than the E6012.

The AWS specifications concerning these new electrodes, according to Mr. Howard, leave something to be desired. His contention: the minimum elongation specification should be higher than what it now is.

He described how ACF used artificial aging techniques in increasing this elongation property. Without such artificial aging, many of the brands of iron-coated electrodes just barely met the minimum elongation requirements.

When aged for 36 hours in an air-temperature furnace, the weld specimens had their elongation properties increased to as much as 26%. These artificial aging tests also showed that a more ductile fracture results than before aging.

Deposition efficiency figures coming out of these tests, Mr. Howard said, showed the E6012 on top, with the other three electrodes tested—E6020, E6024, and E6027—having a deposition efficiency between 71 and 74%.

Mr. Howard's summation: "Iron powder electrodes are here to stay."

Welding of Plastics

The welding conferences were concerned with plastics, automation in the welding industry and maintenance and repair.

Many of the old-time metal men attending the convention were probably surprised to hear of the extent welding is used in the plastics industry. A famed pioneer in this field, Dr. Alfred Henning, Bolta Products Division of General Tire and Rubber Co., was one of the guest speakers.

The theme of the plastics conference: the welding of plastics presents a new set of conditions and problems, but, in many respects, plastic welding is similar to metal welding.

Two families of plastics were discussed—polyethylenes and polyvinyl chlorides. The latter is a little more rigid than the former and presents more of a problem.

Because PVC, as it is called, does not flow, a slight pressure is necessary when joining pieces. Also, it decomposes at about the same temperature it melts, necessitating even more care.

Some of the advantages of plastics: they are highly resistant to corrosion; they do not oxidize. This is as true of the welds as it is of the parent materials. Some of the disadvantages: poor elongation and low tensile strength.

(For a more detailed explanation of the welding of plastics, see in this issue, "Plastic welding comes of age," page 42).

Problems encountered in maintenance welding and cutting operations on radioactive process equipment were dicussed in a paper presented by E. B. LaVelle and J. M. Fox, Jr., General Electric Co. This paper was one of the high spots of the technical sessions.

As J. J. Chyle, first vice-president of AWS, noted in his speech which followed the welcoming address by Mr. Humberstone, the technical papers of the convention could be divided into four categories:

(1) Advancement of progress in welding knowledge;

(2) Economics of welding;

(3) New developments in testing of welds and weldments; and

(4) Development of new materials for welding.

Some of these new developments were "hot off the griddle," as Mr. Chyle put it. Others were extensions of previous research, both in the theoretical and applications fields.

President Humberstone, in his welcoming speech, reflected upon the fast-moving pace of modern industry, mentioning the "challenge of automation to the welding processes." A growing membership and a dynamic philosophy are what AWS needs, he said.

A lively symposium on qualifications of weldors was held the afternoon of Wednesday, June 8. The gist of the conclusions reached: weldor qualifications should depend on service requirements.

Sessions Well-Attended

A great number of convention delegates was attracted by the sessions on inert-arc welding, held Tuesday afternoon, June 7, and Wednesday morning, June 8, and those on weldability and research, also held Tuesday afternoon and Wednesday morning.

Some of the speakers were interrupted by *riveters* on a construction job next to the hotel. Were welding being employed, this never would have occurred!

Although attendance at the welding show was slightly off last year's Buffalo exhibit, most of the manufacturers seemed well satisfied with the type of person who attended. A typical comment overheard during the show: "More of these people are buyers."

Carbon dioxide at the show, too, attracted a lot of attention. But so did many other products. Flame-cutting demonstrations were going on in at least three booths. Examples of welding techniques using various types of electrodes were also prominent in the average day's activity.

Heavy equipment like positioners, turning rolls, etc., were effectively displayed, and more than one visitor

was heard to remark that he wondered "how they got that stuff in here."

But it wasn't all work and no play —not at all.

The social highlight of the week was a western party and outdoor barbecue sponsored by the Kansas City Section, which was held Thursday evening. More than 300 persons were in attendance, and all we talked to certainly must have enjoyed themselves.

The president's reception on Tuesday was another social success. Our sympathy to the national and local section officers who had to shake so many hands, for there was indeed a great number of persons who passed through that line.

Back to Buffalo!

Buffalo, site of last year's meeting and show, will again play host to the American Welding Society next spring. Scheduled for the second week in May, the show may run four days instead of the usual three, according to some of the reports heard last month in Kansas City.

ALL-position, low hydrogen electrode with iron powder in its coating was feature of this manufacturer's exhibit

STILL another exhibit of a carbon-dioxide-shielded welding process. CO_2 was big news at show

WITH all-welded aluminum superstructure, S.S. "Sunrip" starts on shakedown cruise to Jamaican ports

Aluminum superstructure on freighter increases payload

BY HUGH G. JARMAN

THE recently-launched *S.S. Sunrip* lays claim to two major distinctions. She is the largest ocean-going freighter to be built in Canadian yards, and carries the largest all-welded aluminum superstructure of its kind in the world.

Designed primarily as a bulk ore carrier, the vessel will carry alumina (aluminum oxide) from Port Esquivel, Jamaica, to the new Alcan smelter at Kitimat, B. C.

The *Sunrip* is the first ship especially constructed for this trade, as well as the first major merchant vessel to be built with an all-welded superstructure. Davie Shipbuilding Ltd., in cooperation with Aluminum Co. of Canada Ltd., issued special structural design drawings for fabrication and erection of the aluminum superstructure.

All shops concerned also were issued special sketches detailing the particular plate-edge preparations required for use with the type of welding decided upon.

Superstructure on main deck level is 80 ft long by 52 ft wide. The second deck is 62½ ft long by 52 ft wide. Third and fourth decks are 62½ ft long by 32 ft wide. The fifth deck, or wheelhouse, is 27½ ft long by 23 ft wide.

Superstructure from steel deck level to top of wheelhouse is 40 ft high. All dimensions are inside measurements, and do not include surrounding decks.

The welding processes used were the Tig (tungsten inert-gas) process and the Mig (metal inert-gas) process. Both allow the welding of .032-in. thick material.

Both processes were used on the *Sunrip* for assembly and erection. However, in order to reduce production costs, maximum possible use of the Mig process was made. In fact, engineers designed the superstructure so that this process could be used almost exclusively for all shop prefabrication, and for the major portion of shipboard welding.

The Tig process was found particularly useful in welding light-gage material where no filler was required. It was used also where bulkiness and restricted length of lead prevented satisfactory use of the Mig process.

Aluminum plate edge preparations were carried out by means of a portable electric hand plane. Bevel cuts varied from 40 to 60 deg, depending upon plate thickness and welding process employed.

Plate assemblies were arranged to allow the required root gap between plates, and were tack-welded in place with a Mig unit. Continuous welding of plate butts also was carried out with another type of Mig unit.

Type 56S, 1/16-in. coiled aluminum welding wire was used in butt welding. The number of passes required to join plating depended upon thickness of material and plate edge bevel.

On the *Sunrip*, only two passes were necessary, and one back run was made after required chipping with a pneumatic hand chisel. Beams and stiffeners also were added to sub-assemblies using the Mig process.

The joining of sub-assemblies required a good deal of vertical butt welding. The Tig process was preferred for this task, using 3/16-in. electrodes. Tig welding also was employed for fastening hangers and small fittings, for aluminum pipe work, hatch covers and small tanks.

Riveting was used for connections

of aluminum casings to steel structure. The junction of the casing to steel coaming was backed up with a steel butt strap isolated from the aluminum with a lining compound.

Speed Varies

Various welding speeds of both Tig and Mig methods on the *Sunrip* superstructure were carefully noted.

Average speed on butt welds, using the Tig process on ¼-in. thick material, was 26 ft 5 in. per hour, compared with 42 ft per hour for the Mig process. With ½-in. thick material, the comparison was 13 ft per hour (Tig) to 24 ft per hour (Mig).

Welding speeds for fillet and lap welds vary from 40 ft per hour on ¼-in. thick material (Tig), to 85 ft per hour for the Mig process. With ½-in. material, the comparison was 30 ft per hour (Tig) to 40 ft per hour (Mig).

These welding speeds apply only to the *Sunrip*, and are not standards. Shipboard welding speeds may differ with identical procedures on various vessels.

Joints between aluminum and steel structure required special attention in order to avoid direct contact and resultant corrosion. On the *Sunrip*, engineers recommended that all joints be made 9 to 12 in. above deck—well clear of any fitted sheathing.

Metals Isolated

Facing surfaces of steel and aluminum were treated with liquid neoprene. One coating usually was sufficient. Where heavier coatings were necessary, two coats were applied, giving an average thickness of .02 in. This material must be cured in a temperature not lower than 60 F, so all coatings were applied in the shops.

Isolation of dissimilar metals was required elsewhere in the superstructure, on piping, ventilation trunking and electric cables. Non-aluminum items were kept off bulkheads or decks, and isolation with liquid neoprene was made at clips or hangers.

In addition to the superstructure, aluminum bilge and ballast piping systems are employed for the first time. Other aluminum applications include life boats and davits, hatch boards and beams, engine room casings, furniture, stanchions, ladders, fire and deck wash lines and the funnel.

Welding, rather than riveting the superstructure reduced the weight of the vessel an estimated 4%. The 136 long tons of aluminum used on the *Sunrip* increased her cargo-carrying capacity by approximately 175 long tons.

These facts, from the owners' point of view, indicate the *Sunrip*'s principal value. There are, however, two additional important advantages.

Sunrip's welded aluminum superstructure is non-magnetic, and the non-corrosive qualities of the metal greatly reduce the cost of maintenance, repair and painting costs.

SHEATHED screen between upper deck and bridge deck

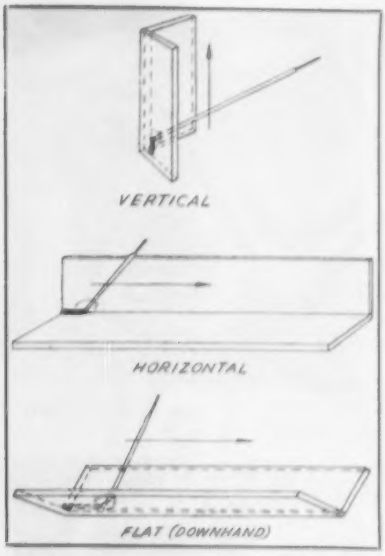
WELDED aluminum outside ladder leading from boat deck to bridge

ALUMINUM studs are Tig-welded on hurricane deck to hold wooden overlay

HATCH cover being filled with fibre-glass shows formed sheet with 3 channels intermittently welded as interior stiffeners

Process and tool for better, faster production welds

BY REX CLEVELAND
Design Engineer
Minneapolis-Moline Co.



MOST common welding positions encountered in production welding

THE INTELLIGENT processing and tooling of production weldments requires an intimate knowledge of the science and metallurgy of welding, plus a thorough acquaintance with methods and with the possibilities and limitations of various types of welding equipment.

One of the greatest opportunities to cut production costs lies in planning welding production. This is the responsibility of Processing, and not a simple one at that.

Each weldment presents a new problem, the only constant being standardized procedures adopted by the shop. The tendency is to place all weldments in the same category, and to adopt a method of handling, locating, holding, welding and removing weldments which will accommodate all sizes and types of assemblies. This imposes a terrific cost burden on most assemblies, and necessitates planning each job separately.

Large or small assemblies in small quantities are a one-man job—two at most, for sometimes it is best for one man to set up, the other to weld. Welding in large quantities requires breaking assemblies down into small weldments, using high-speed fixtures and allowing each weldor to become so proficient at his part of the total job that efficiency rises to the highest possible level.

The object is to lop as much as possible off the labor and overhead portions of the welding dollar by raising the 40% common operating factor.

Not much can be done about increasing speed of welding in small quantities by better processing, whether the weldments are small or large. Still, even where quantity is small, it sometimes pays to make simple, inexpensive fixtures which will position the parts properly, hold them to prevent distortion, and make welding easier.

Few weldments lend themselves to self-positioning of parts, so uniformity between assemblies cannot be attained without fixtures. Distortion occurs and weld quality drops while costs increase rapidly.

Plan Carefully

Economical production of weldments in large quantities demands careful study and planning. So much is at stake, costwise, that no limit should be placed on proper planning of methods, procedures and tools required to bring about the most efficient solution to each problem.

Always try to hold arc time to an absolute minimum. This is the primary consideration because it is the most expensive part of the welding process. Processing must assume that Engineering has specified the correct weld and procedure for the job, insuring a strong weld at economical cost.

It is Processing's job to help the weldor carry out this procedure without interference, with a minimum of effort, and without time-consuming handling when placing parts in the fixture or removing them after welding.

Processing must also plan the all-important "positioning" feature of the welding procedure, for great welding cost losses can result from improper positioning. These losses usually occur in large, complex weldments, where placing parts in the most advantageous position for high speed welding is usually difficult.

The answer is to break large assemblies into smaller weldments for proper positioning. A final assembly is then made with far less welds out of proper welding position.

It sometimes takes considerable maneuvering to attain the least costly welding position. Frequently, several welds in an assembly must suffer in order to economize on the larger or more numerous joints. This means an overall saving for the complete assembly, however, and it is time and effort well spent, for cost differences are tremendous.

Overhead welds can be avoided so easily that their excessively higher costs will not even be considered in this discussion. There is no excuse for their occurrence in production welding.

Vertical welds, the most expensive of production welding positions, should also be avoided. Sometimes, however, the cost of finding an alternative is too great to pay off in savings.

Weld joints should be positioned for "downhand" welding wherever possible. Welding with the electrode pointed down and tilted 30 deg in the direction of travel greatly increases speed and cuts welding costs in direct proportion.

Horizontal welds in the downhand manner may be made at relatively fast speeds, but large fillets require several passes due to the tendency of molten weld metal to run out thick on the flat plate and thin out on the vertical one. Flat or tilted welding positions should always be used in preference to any of the others.

Tilt For Strength

Tilting the axis of a flat-positioned joint about 10 deg down in the direction of travel, holding the electrode slanted about 30 deg with the vertical in the direction of travel, and increasing current settings 30% over standard recommendations compensates for the weaker joint which would result if this were not done.

The weld produced by the downhand method penetrates deeper, and with a more concave weld contour. This means less wasted weld metal. Vertical welds re-positioned for tilted downhand welding can be made at ⅓ their former cost.

Re-positioning horizontal or flat welds for tilted downhand welding saves from 25% to 50%, depending upon the size of the weld. The savings attained will pay for a considerable amount of extra planning, more fixtures and a lot of extra handling on any long-run welding job.

Large assemblies should be broken down into smaller weldments, each of which can be positioned for fastest possible welding speeds. This usually helps to make welds more accessible. These separate sub-assemblies should be welded into the final assembly by using two fixtures, one for locating or positioning, the other for final welding.

Separate operators should be used for each, thus increasing their proficiency by specialization and gaining higher overall efficiency for the job. Costs can often be cut 10% in this manner, and welding results will always be much better.

In the same manner, lower costs and better welds can be obtained on long runs by splitting up welding operations among several operators, and by providing helpers to place parts in fixtures and remove welded assemblies. Each weldor will then become so proficent at his particular task that he can develop almost unbelievable production speed, yet maintain standard weld quality.

On high production welding the weldor should do nothing but weld!

Methods

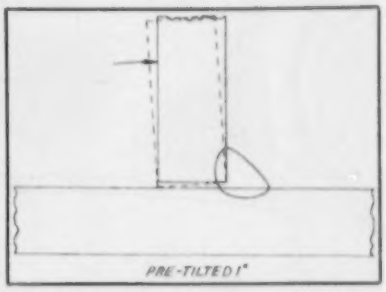
There are three principal methods available for production welding of steel. Most used is the coated-electrode, shielded-arc method, but the inert-gas, shielded-arc method is presently coming to the fore. Third is the submerged-arc method, using a bare-wire electrode and granular flux.

The coated electrode can be used either with a-c or d-c current, from generator, transformer or rectifier sources. The inert-gas shielded arc, and the submerged arc methods use only d-c current from any of the same sources.

Each method has its separate merits, as has each type of current source. The coated electrode method has been in use longer than the inert-gas shielded arc method, but tests and performance data indicate that quality of welds produced by either compare quite favorably.

In using the coated electrode, current supply must depend upon electrode type and application. Manufacturer's instructions usually specify the type of current best suited for good welds at highest possible welding speeds.

In most welding shops, the coated electrode weldor actually welds only 24 minutes out of every hour, or at 40% of peak performance. The balance of his time is spent making the arc, changing electrodes, resetting his machine, cleaning slag, placing parts in the fixture and unloading them when the weldment is complete.



LOCATING pieces out of position to counteract weld shrinkage

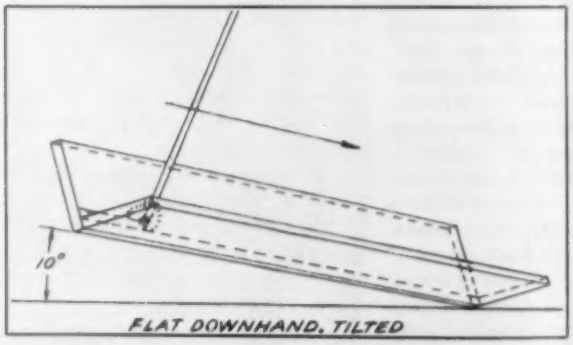
Welding at 100% efficiency, a weldor could deposit a ¼-in. fillet in one pass with a ¼-in. E-6012 electrode and a machine setting of 300 amp, at the rate of 10 in. per minute or 50 ft per hour.

At 40% efficiency, this would drop to 20 ft per hour. At a labor cost of $2.00 per hour, this is $0.10 per ft, or $0.0083 per in. Using a 300% overhead figure, the cost becomes $0.033 per in. Each inch of weld would consume .0166 lb of electrode at $0.115 per lb, or $0.0019 worth of electrode. The total cost of the weld would thus be $0.035 per in.

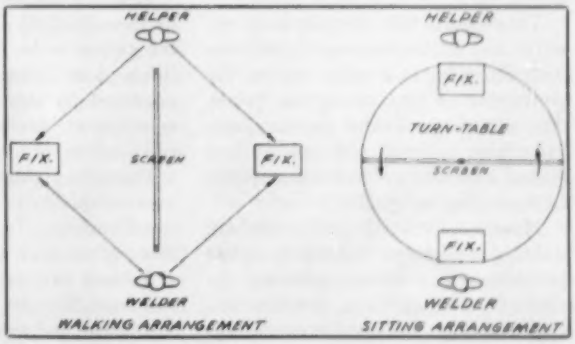
Using the coated electrode with any type of a-c current source almost completely eliminates the "arc blow" common to d-c welding. This decreases both welding time and cost, and increases weld quality. However, it is not recommended for plain or lightweight, V-groove butt welds. Here, d-c current produces a better weld at higher speeds.

Cost Advantages

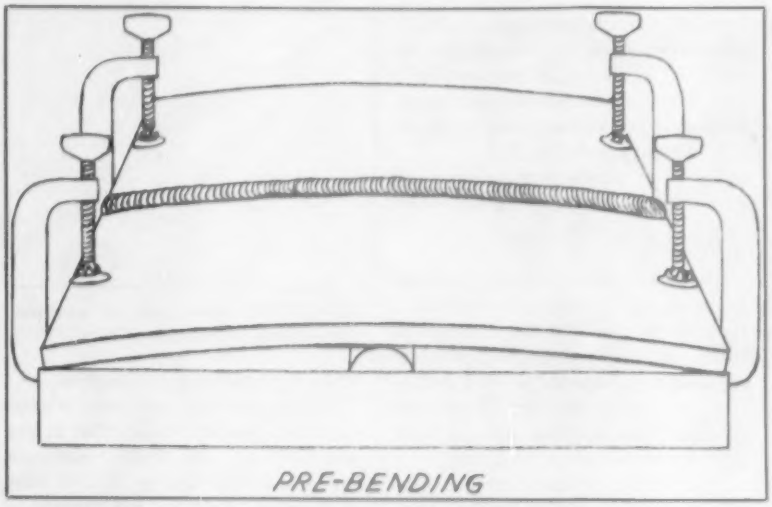
The inert-gas shielded arc method of welding possesses distinct cost advantages over the coated electrode method on horizontal and flat weld positions. In some cases, the margin



CORRECT electrode position for flat, tilted downhand welding increases speed and cuts costs



TWO possible high-speed, low-cost welding arrangements using a weldor's helper



METHOD of restrained pre-bending of weldment which will counteract effect of weld shrinking during cooling

runs as high as 100% or more.

Cost of electrode wire and gas consumed per foot of weld is much greater (200%), but welding speeds run 150% to 200% higher than possible with coated electrodes, depending upon type of joint, size of weld and welding position.

In addition, due to the fact that electrodes need not be changed and no time is lost in striking the arc or in cleaning slag, the operating factor with this method is usually 85%, instead of 40%.

Submerged-arc welding can be a real cost-saver, producing welds of highest quality. Principal drawback to the automatic submerged-arc welding machine is its limitation to one position. Low on maneuverability, it can weld only on flat-positioned joints along which it can be moved, or which can be drawn, rotated or revolved under it.

(Actually, some fabricators use this process in horizontal and vertical positions. See "Vertical welding of field tanks," WE, Nov., 1954.)

This means that straight-line, circular or circumferential welds are well fitted for it if there are no impediments or gaps along the joints. The automatic welder cannot jump over obstructions, although it can follow contours or undulating joints by camming or guiding.

Manufacturers of submerged-arc welding equipment furnish complete procedure instructions, covering design of parts, wire size, machine setting and other factors for proper application of this welding method. These should be followed as carefully as those for welding with coated electrodes.

Lacking gas-shielded arc equipment, or an automatic submerged-arc welder, a shop over-burdened with coated electrode welding equipment is not going to purchase this more economical type of equipment unless savings justify the act.

The best procedure is one of gradual replacement of old equipment as it wears out, to save loss on old machines.

Tooling

Tooling for welding is a science in itself. Jigs or fixtures must be built to hold the parts of a weldment in a position or location which will remain in accordance with the assembly drawing *after the welds have cooled.*

These jigs or fixtures must conform to the production plan established by Processing, and must not interfere with accessibility or the ultimate welding speed goal.

It is not the task of either Design or Processing to determine how these things are to be done. Design establishes parts dimensions, locations and positions by drawings and by designation of standardized procedures required to produce the welds.

Processing plans for the most economical quality production to fit these specifications. Tooling must follow these plans and specifications.

Tooling carries a heavy burden of responsibility for keeping welding costs down and maintaining high weld quality. Jigs and fixtures must be designed not only to hold securely as many parts as possible, but also to allow fastest insertion and removal, to prevent slippage, and to pre-set those parts subject to distortion or movement in welding, or to shrinkage during cooling.

Fixtures should have as few clamps as possible, because of the high cost of clamping time. Parts should be positioned by stops, other parts, or by pins in slots or holes. Much clamping can be eliminated by placing parts edges under offset ears or bolt heads, or by other devices.

Provision should be made for tumbling, turning or revolving fixtures where required to invert assemblies, tilt them for most advantageous weld positioning, or to make certain welds more easily accessible. Small parts usually can be flopped over in a light fixture.

Large assemblies require more complex methods of handling—the largest and most cumbersome sometimes requiring turning or revolving mechanisms with heavy power sources to save time and labor.

Some welds — particularly those made with automatic welders—may even require camming or indexing mechanisms, or both. Where production is high, tooling cost should not be the major consideration.

Parts which have a tendency to bend or bow when the weld cools should be pre-bent in the opposite direction to the same degree. Butted joints are the most common offenders.

Curing distortion contributes greatly to the quality of weld and to its lower cost. A large part of excessive welding cost in most production plants is due to the necessity for correcting and re-welding distorted assemblies.

Tooling must realize that just because a drawing calls for a 90 deg position for a "T" joint, it does not follow that the fixture should hold the part in this position before welding. The 90 deg position is the requirement set for assembly. It is Tooling's job to see that it is met in the *finished* assembly.

Proper processing and tooling of production weldments can make or break welding, cost-wise. It can also bring about production of better weldments with accompanying lower scrap percentage.

Time and money spent on better processing and tooling pays its own way many times over.

Ryan Aeronautical Co. asks its employees to challenge their welding jobs, and to . . .

Work smarter!

CHALLENGE the welding job and its details! This is a basic philosophy of the work simplification program inaugurated by Ryan Aeronautical Co., San Diego, Calif.

It's the type of thinking that pays dividends in better methods. From superintendent to the man on the production line, employees are urged to work *smarter*.

They are encouraged to ask five "W" questions about their jobs: what, where, when, who and why. This approach leads to such queries as "Can my job be done with less effort, less time, less material or less space? Can it be done with less reaching, lifting or moving?"

Charged with prime responsibility in this work is a Methods Engineering Division, one section of which is devoted to methods improvement work. In each main production area, a methods engineer analyzes methods, machines and layout, and makes recommendations to the production superintendent.

ELIMINATING the need for adding extra filler metal to seams, as well as tedious grinding work, Ryan-built seam rollers do the job in one-tenth the time

ONE man now can place large fuel tanks into position on spot-welding machine. Rotating lower electrode eliminated need for several helpers

These men work along three general lines of inquiry. First, they study other industries and plants to visualize how their techniques may be adapted to Ryan. Second, they analyze layouts and machine loadings to improve production and to dovetail new products into existing assembly lines.

Employee Opinions

Encouraging the development of conservation suggestions from all plant personnel is a third important task performed by methods engineers.

Another section of methods engineering performs time studies and develops manufacturing control charts. These establish standards of performance for new and improved jobs and show labor hours performed against those budgeted. From these charts, it is possible to get clues about time-consuming operations which lend themselves to method improvement.

Aligning and spotwelding large stainless steel exhaust system stampings by hand, for instance, took 45 minutes per section and resulted in high scrap losses due to precision requirements.

These stampings are now tacked by an arc-welding process in a special clamping press. Work time per section was reduced 25 minutes, and scrappage cut 60% while savings amounted to $3,000 per month.

Seam Rollers

Removing excess filler rod and weld metal from thousands of welded tubular sections of stainless steel was a tedious job with air-driven grinders. Now, welded seams are rolled flat in one-tenth the time with Ryan-built seam rollers which also refine the grain structure of the metal.

Several helpers were once required to lift large fuel tanks so that internal bulkheads could clear the spotwelding machine electrodes. By making the lower electrode rotate, with a hydraulic piston and foot control, 10 in. of added clearance are obtained which allows one man to push the tank into the machine without lifting.

Realizing that the man on the production line is one of the best sources for new methods ideas, Ryan holds monthly "self-starting" meetings in all production areas.

Here, these ideas are generated and everyone is made conscious of the philosophy constantly being developed and refined: *Work smarter—not harder. Challenge the job.*

AERIAL view of state dockyard. Ship construction buildings are on right; engineering buildings are in foreground

REPORT FROM AUSTRALIA

"Down under," as well as in other progressive countries, welding is the basis for . . .

Modern trends in ship construction

BY R. ELLIS
Shipyard Manager
State Dockyard, Australia

IN 1942, on a barren block of land previously used as a coal marshalling yard known as Dyke End, the shipbuilding industry was reborn in Newcastle, Australia.

Today this modern dockyard—The New South Wales Government Engineering & Shipbuilding Undertaking, better known as the state dockyard, Newcastle—is employing prefabrication methods unsurpassed by any other merchant shipbuilding yard in Australia. These methods, in fact, compare most favorably with the average yard in the United Kingdom.

In the early years, the exigencies of war necessitated improvisation and the use of available machinery and building materials. But those responsible for the overall plan always had in mind the necessity of establishing a stable economic shipbuilding industry in this country.

The layout of building berths, workshops and machinery was so arranged to allow improved methods of construction to be introduced as soon as suitable labor, machinery and lifting facilities could be made available.

Economic Problem

In arriving at the present advanced stage of block and panel prefabrication methods, certain obstacles had to be overcome and risks taken.

The physical problems were formidable, but to those responsible for introduction of more welding and the development of prefabrication methods, the economic problem was by far the greatest.

In achieving the required results with the maximum economy of effort and material, personal responsibilities and obligations were required of all sections of the establishment.

Management had to balance the expected savings in costs of prefabrication and welded ships with the capital invested in the welding plant, jigs, fixtures and lifting facilities.

These risks are greater in Australia than those encountered by shipbuilders in the United Kingdom. Because of the huge volume of orders, many yards in the rest of the Kingdom are able to concentrate their efforts on specific ship types, and they benefit greatly as several ships are often built off the same scrieve (template).

Certain rolled steel sections especially designed for welded structures are unobtainable in Australia, and the shipbuilder is faced with costly improvisation or has to resort to riveting of bulb angles or channels in order to obtain the required section modulus.

The dockyard has developed its prefabrication methods without the use of complicated jigs. And riveting is now used only to balance labor and to overcome the difficulties mentioned above.

The attitude of certain employees to new methods was a formidable obstacle. Some employees were loath to accept modern practice and the introduction of labor-saving machinery. They erroneously believed their craft was being belittled and that the use of modern equipment would rapidly diminish their numbers.

However, the work of shipbuilding tradesmen is becoming more and more scientific, and the average employee now realizes that by improved production methods and increased output he is securing for himself continuous employment and creating a field of activity for increased numbers of the shipbuilding fraternity.

In a very short period, the dockyard's labor force has been increased 20%.

Design

It is the firm opinion of the writer that welding practice and prefabrication procedure is still far in advance of welding theory.

Shipyard management is playing a greater part in drawing office affairs as it is impossible to efficiently plan production in the workshops if it is necessary to indulge in large scale departures from the many construction drawings.

Since the special requirements of the shipowner or ordering authority must at all times be respected, it is not always possible for the dockyard's economically planned procedure to be introduced entirely into the structural design.

These requirements having been determined, the overall plan of production procedure is developed and decided upon in the drawing office even before the material is ordered or before midship-section and profile and deck plans are submitted for approval of the proper classification society.

From the designer's viewpoint, the change from riveted to welded ship structures is very considerable. Apart from the additional drawing office work necessitated by modern welded practice, the draftsman is required to think in terms of welding and to familiarize himself with the practice in the shipyard, the facilities available and the disposition and capacity of shipyard cranes.

It is desirable to produce a simple hull form for welding. Where possible, the lines allow for the elimination of deck sheer over the midship body. Straight camber with a knuckle at the hatch sides is introduced, and the bilge radius is made as large as practicable to enable a maximum of parallel length to be achieved.

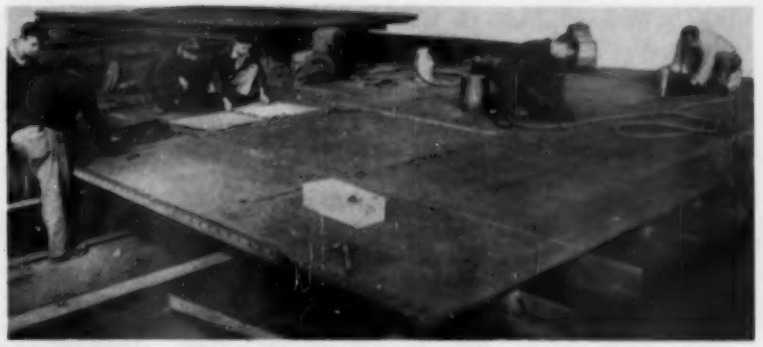
The working drawings for shipyard use embody a great deal more information than was the case of the orthodox-built riveted ship. Apart from the multiplicty of welding notes, the drawings show clearly limits of sections to be prefabricated, the weights, and, in cases of sections which are not uniform, the position of the center of gravity for lifting purposes.

Construction

To simplify progression through the plater's shop, the loft templates and steel plates and sections are similarly marked to the sections depicted on the drawings and racked accordingly.

While the amount of templating in the mold loft is considerably reduced, other information such as buttock and waterline offsets applicable to the various prefabricated sections is supplied to facilitate the fairing of panels on the skids prior to erection on the building berth.

A special scrieve of the floors is also prepared which eliminates necessity of marking off steel plates before cutting to shape. These scrieve boards are fastened to the tracing table of a modern oxyactylene profile-cutting machine, and by means of a manual tracing control port and starboard floor plates are cut to shape simultaneously.



WELDORS and shipwrights work together on a deck panel. The semi-automatic submerged-arc process is being used

Intercostals, beam knees, brackets and other similar components of the same dimensions are cut to shape on the same machine. But for these a steel template is used, and a magnetic tracer is fitted to the tracing control.

Submerged-Arc Is Used

The ship construction building consists of five bays, four of which house the usual shipyard machinery, frame-bending facilities and marking-off tables. Light fabrication is also carried out in this shop.

The main fabrication bay is 400 ft long by 72 ft wide and is served by two overhead cranes—one 15-ton capacity, the other 10-ton capacity. It is equipped with d-c automatic, semi-automatic and manual welding facilities.

Sections, including double bottoms, bulkheads, decks, masts, engine seatings, etc., to the full capacity of the cranes, are completed in this shop ready for erection on the building berth.

The welding sequence is such that each component being assembled into a full section is positioned to enable all welds to be made in the down-hand position. Extensive use is made of the submerged-arc process, which eliminates to a great extent the necessity of veeing the plate edges.

In the course of assembling the double-bottom units, all pipes, bulkhead pieces, manhole covers, etc., are fitted. The deck sections, including hatch sides and bulwarks, are completely fitted with bollards, fairleads, mooring pipes and all rigging fittings.

Masts and derrick posts are complete in all respects and are finish painted before they are taken from the shop.

The primary object of proceeding to this degree of completion before erection is to increase efficiency by minimizing the number of welds on the building berth. It has been found that this practice also assists in expediting the fitting-out and painting of the ship generally.

From the shipyard shop, the sections are transported to the sub-assembly areas or directly to the building berth.

Although the dockyard has four building berths, it has been found that through the new methods the same volume of work can be executed on two berths as was accomplished on four berths when the orthodox construction processes were used.

The two smaller berths are now used for tug and dredge construction.

Riveted or composite riveted-and-welded construction methods are employed there.

45-Ton Cranes

Each of the two larger berths is served by three cranes—one of which is capable of handling loads up to 45 tons. The three traveling-type cranes also serve the main assembly areas at the head of each berth.

Complete bow and stern sections, side-shell panels and double-bottom units, etc., which are beyond the capacity of the shop cranes, are prefabricated on these assembly areas.

One crane has an auxiliary hoist

which, in conjunction with the main hoist, enables large sections to be turned over for position welding without the aid of another crane.

Since no suitable sections are obtainable in Australia for welded main frames, these members are riveted to the shell plating. The riveting, however, is completed on the assembly area.

The midship double-bottom sections are the first to be erected, and from then on prefabricated units are erected in a definite sequence, port and starboard units being positioned simultaneously and progressively from amidships towards each end.

The general welding procedure is to start at the center and work towards the ends of each section. Welders are employed port and starboard, and are required to work simultaneously towards the sides, the ends and up from the bottom so that at all times and in every direction welding is advanced towards a free end.

A certain amount of shrinkage takes place, but it has been found to be uniform.

At no time is any rigid restriction put on shrinkage. The cleats and dogs used for holding the butting surfaces together are so arranged that the material is free to move along the direction of the weld. As there is always a free end in the direction normal to the weld, movement is also unrestricted.

During erection and subsequent welding of the many prefabricated sections, a careful check is made of any resulting misalignment, and, should it be necessary, it is rectified by varying the welding sequence.

In fitting out a ship, the stud welding gun has proved a useful and versatile tool. It is used extensively by shipwrights, electricians, joiners, plumbers and sheet-metal workers.

The Advantages

It must be realized that before a shipbuilder can embark on a program of welded prefabrication, the shipowner naturally will have to be satisfied that the considerable departure from the orthodox will be to his advantage.

These advantages show up not only in initial cost but in consideration of efficiency, maintenance and, possibly of major importance, the effect on cargo deadweight capacity.

During and immediately after World War II, failures in welded ship construction were greatly magnified, and the industry was maligned.

Since then, however, the Admiralty, classification societies and welding advisory panels have faithfully acknowledged the reliability of welded ship structures.

Most shipowners, therefore, accept the welded ship as being thoroughly seaworthy and welcome the advantages over the riveted ship.

The initial cost of the welded ship in Australia is at present only slightly less than its riveted forerunner, but it is confidently expected that the constant development of welded prefabrication techniques will result in further substantial savings.

The welded ship is appreciably lighter than the riveted ship because connecting flanges, angles and laps are eliminated, and the section modulus of the various components is utilized to the fullest extent.

This difference in weight represents the additional weight of cargo that may be carried. And over the life of a ship, the revenue obtained by the shipowner from this source alone is considerable.

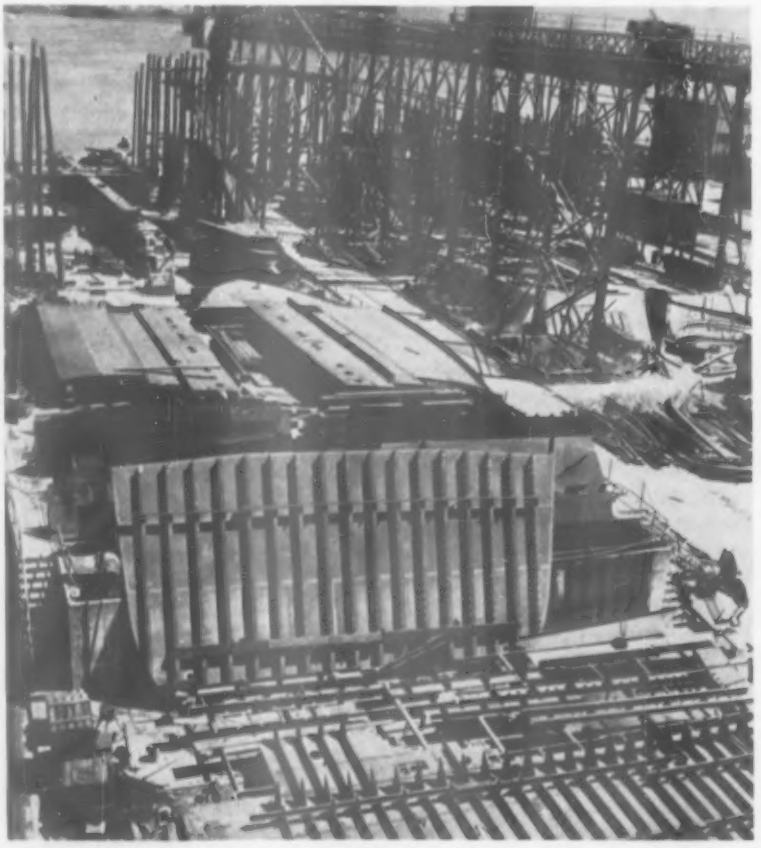
Damage to cargo due to sprung rivets and leaky seams is no longer experienced. The accumulation of rust between faying surfaces, which results in high maintenance costs, has been considerably reduced in the welded ship.

In instances where welded ships have suffered underwater damage, the welding has held, and it was reliably reported that such damage was less than would have been occasioned in riveted ships.

The reduction in weight and the elimination of eddies caused by plate laps and rivet points has enabled designers in some instances to effect economies in propulsive power.

Welding is therefore providing shipowners with cheaper and stronger ships with a greater payload capacity.

Welded prefabrication methods enable the shipbuilder to construct ships with greater efficiency, economy and speed.



BUILDING berth and assembly area. Shown are prefabricated bulkheads, shell panels and bottom sections ready for erection

OWNER O. R. Fischer stands before ornamental treillage in his showroom. Hundreds of arc welds were used to fabricate the ironwork

Welding ornamental "iron"

Most of it may not be really iron, but it *is* ornamental. And welding has played an important part in bringing such metalwork within reach of the average homeowner's budget.

BY F. T. TANCULA

WHEN ornamental ironwork first became popular — many years ago—only royalty and the wealthiest could afford it. Today, it is almost impossible to pass through a residential section of a United States city without seeing numerous examples of such ornamentation.

The use of ornamental iron on homes and other buildings has grown phenomenally since the end of World War II. Not the least of the many reasons for this popularity is the relative inexpensiveness of such work—a result made possible by modern fabrication methods.

Fischer's Welding Service, Inc., located in Franklin Park, Ill., a suburb west of Chicago, uses these modern means in manufacturing its ornamental iron. Flame-cutting, welding, brazing and grinding comprise the allied processes that are employed.

An Assembly Tool

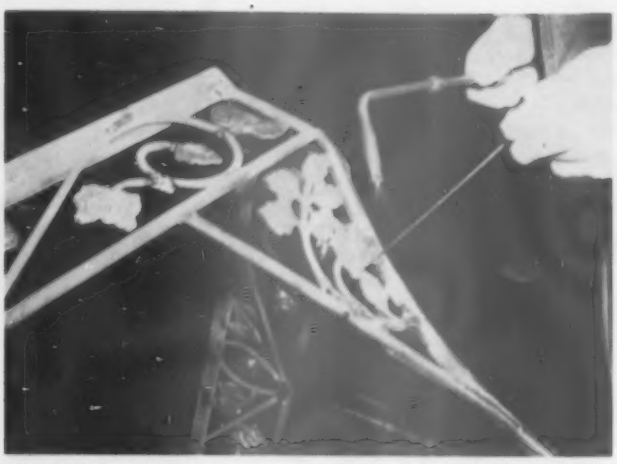
At Fischer, welding is an assembly tool, not a mass-production device, because each job is custom designed and built. The firm annually uses about 335 tons of mild steel and castings. By far the greatest percentage of its ornamental "iron" is really mild steel, which it obtains from the mill in 16-ft bars. The more intricate patterns for treillage (trellis or latticework) are purchased in the form of malleable cast iron. These castings are then brazed into other work.

Six of the 25 employees of the company are full-time weldors, but everyone has had some welding training. (A few years ago the owner sent all his men to a welding school conducted by the local high school.)

In addition to shop welding, a great deal of joining has to be done on the job site. This field work is accomplished by means of a rolling

FLAME-cutting various sizes and forms of mild steel is the first step in the production process

WELDOR here is completing assembly on ornamental "iron" railing. Every one of the shop men can weld



BRAZING intricate patternwork into mild-steel frame. It is here that actual iron is used. Patterns are malleable cast iron

RAILING has just been dipped into tank for coating of paint and zinc dust

fleet consisting of three trucks. Each truck has a two-man crew and carries what amounts to a fully equipped welding shop. It contains a combination power plant and a-c, motor-generator arc welder (200 amp) and complete cutting equipment (comprising two cylinders, torch and 150 ft of twin hose).

Shop Equipment

The shop equipment, housed in a building across the alley from Fischer's modern showroom, includes eight flame-cutting torches and eight a-c transformer welders of varying power ratings.

The shop equipment also includes a hydraulic machine for bending pipe. Designed by Oland Ray Fischer, president of the firm, and built by his employees, it is of arc-welded construction. In a recent year, the machine was used to bend 9,000 linear ft of pipe for railing purposes.

Here is a typical production sequence:

The steel is brought from storage to the shop's flame-cutting area. (Scroll work for any ornamental design is not cut, but normally is bent by hand in a bending vise because of the call for varying sizes and shapes.) No pre-cleaning is attempted on the steel; it goes through production stages in the as-received condition and is treated after fabrication.

The layout man flame-cuts the material according to the individual job plan. This plan may consist of only a rough sketch, but every man in the shop is able to read it. If designated, holes are then punched into the material by a standard punch press operated by the layout man. These holes are made to help conceal certain welds, in railings, for example. (Welds that cannot be so concealed are later ground flush.)

After cutting and punching, the layout man gives the sketch and components to the weldor who begins assembly. The weldor works on a table fitted with jigs and fixtures necessary for the job. Most of the welding is downhand.

FINISH grinding of welds is an important step in the process

Two Classes of Electrodes

The Fischer firm uses two classes of electrodes, the E-6012 and E-6013. Their smooth weld characteristics and easy slag removal are the reasons, according to Mr. Fischer. To fabricate the 335 tons mentioned previously, the firm uses 11,000 lb of such electrodes.

If the job happens to be a trellis or a piece of furniture that will include some intricate design work, the weldor turns it over to a torch operator who brazes the cast-iron ornamental leaves (or whatever the design might be) to the welded assembly.

The shop joining is now completed, and the finished weldment is channeled to the dip-tank shed, outside the main shop building. Here the ornamental ironwork is given a zinc-dust coating, which acts as a cleaner and protective coat. The zinc dust floats in a paint vehicle, and when the work is dipped, it comes out coated with paint and fine flakes of pure zinc.

Of course, additional flame-cutting and welding might be necessary on the construction site, and that is the duty of the three truck crews.

The majority of work undertaken by Fischer's Welding Service is of a sub-contractual nature. The firm is associated in this manner with about 400 small and large contractors.

Mr. Fischer started his company in his garage in 1945. In 1950, the factory it now occupies was built, and in 1954 the modern showroom was completed. Mr. Fischer started in the industry more than 12 years ago, as a weldor's helper on a pipeline job in Georgia. He went to Chicago, attended a weldors' school there, and has been in welding ever since.

He is sold on welding, and credits it with much of his success. Mr. Fischer was asked why he welds his ornamental work, instead of riveting or hand-forming it, as some of his competitors do. His answer:

"Welding is the fastest way to join metals . . . I wouldn't do it any other way."

Built to conquer the Arctic

THE WORLD'S largest vehicle on rubber tires—a truck so big it will carry ten freight vans in tow—soon will be doing just that across frozen snow trails of inland Alaska.

Dubbed "Sno-Freighter" by its Longview, Texas, manufacturer, R. G. LeTourneau, Inc., the 274-ft transporter is so long it had to be coupled in six sections in order to turn a corner.

The Sno-Freighter consists of a power-control car and five cargo cars, each with a load capacity of 25 tons. Individual cars can be uncoupled for loading and unloading. Diesel-electric generating sets in the power-control car supply power to 24 electric wheels which actually drive the vehicle.

This new system for delivering drive power provides each wheel with an electric motor and gear reduction unit inside its rim. Low-pressure tires, 88 in. in diameter and 38 in. wide, are mounted on the wheels for traction and flotation over snow and frozen surfaces.

Sno-Freighter was produced completely in six weeks—from drawing board to delivery. Speed was necessary so the transporter could undergo operational tests over actual freight routes before the Spring thaw.

Fabrication of principal structures by welding made possible such a tight production schedule. Repetitive design of the five cargo cars also simplified parts cutting and fabrication work.

The body of the power-control car is of welded aluminum construction. Pieces for the floor, roof and the reinforcing corrugations used were pressed from aluminum sheet.

TUBULAR steel, shown being arc welded, served as chassis for power-control car body

GIANT Sno-Freighter towers over inspection team. Five cargo cars, built to carry 25 tons each, are shown coupled and loaded

These and other pieces were cut oversize and formed before they were supplied to the body fabrication crew. They were then cut to fit, clamped together and welded by the Mig (metal inert-gas) process. The fuel tank also is of welded aluminum construction—cylindrical in form with pressed aluminum heads.

Main structural members of the freighter sections—frames, beds and axles—were made by cutting and welding tubular steel. Powered jigs were used to build the axles, weld on flanges, ball suspensions, reinforcing rings, and to cut inlets.

Beds for the power-wheeled cargo cars were fabricated by welding, and the beds were then used as jigs for fabrication of the main frames for the cars.

For protection of cargo and engines while fording streams or traveling through brushy country, the Sno-Freighter's decks are 8½ ft off the ground. All cars are water-proofed to a height of six ft.

Actual dimensions are: length, 274 ft; width, 16 ft, 4 in.; height, 17 ft, 6 in. Highest point is the operator's cab at the front of the power-control car.

Despite terrain conditions and the Sno-Freighter's massive construction, it maintains load stability at all times. Over rough surfaces the car couplings and wheels rock and gyrate with every change of topography, but beds of the cars undulate only slightly.

This stability is achieved by a unique axle suspension system, and by coupling all cars through a universal joint and a long steel tube resembling a wagon tongue.

The rear axle of each car is pivot-suspended on the main frame member, which keeps all four wheels of the car on the ground and driving. Front axle supports are fastened rigidly to the main frame, but the axles are free to swing left or right for steering.

The power-control car, which provides living accommodations for a four-man crew, is insulated, and its double-walled windows are tinted to reduce glare of snow-reflected sun rays.

Alaska Freight Lines, Inc., purchaser of the Sno-Freighter, will use it to provide an overland freight link between areas normally isolated for part of the year by winter cold and snow.

WELDOR puts finishing touches on huge axle for power-control car

The future is bright

By
Welding Engineer Research Department

Though last year's statistics indicated that welding industry sales were off 13%, 1955 sales to date are up about 20%

With the publishing of "It was a good year, despite drop" (WELDING ENGINEER, June, 1955, p. 23), there have been numerous requests for additional data on welding sales.

On the opposite page are comparative statistics on the welding industry for the past five years. In addition, there has been included data on electrode and welding rod production, steel production and related comparative figures dating back to 1939.

While 1954 was a year of adjustment in the welding industry, the first five months of 1955 indicate that it is a year of advancement. Business activity is headed for an all-time high; welding sales for the year should exceed $625 billion.

The advent of CO_2-Mig welding, together with a more widespread use of other forms of automatic welding, will contribute to the boom.

All Industry Running Ahead

Automobile production has been breaking records throughout the year. This pace was slowed by wildcat strikes recently and will definitely drop off during the model-change period in the Fall.

A slow-up in auto production should be reflected by a similar condition in steel, but it appears that other customers will take up all the slack to keep steel production high.

Steel output has been at a record high for the past three months, exceeding the total for corresponding months of last year. By the end of May, the estimated production of steel ingots was over 46 million tons as compared to 36 million tons for the first five months of 1954.

Production of all metals, especially copper and aluminum, are likewise running at an all-time high, but the demand is such that some metals are in short supply.

The present increase in industrial expansion is reflected in increased production schedules of factory equipment producers. Metal furniture and household appliance manufacturers likewise have increased production to meet the ever-rising demand of consumers.

All these industries were among those hardest hit in the business dip that carried welding sales downward in 1954. With their recovery completed and production approaching new peaks, the outlook for welding in these fields is especially good.

Welding for Repairs

In the non-metal-working fields, where welding continues to play an increasingly important role as a means of maintaining equipment, all-time output highs were reached in April and have continued through May.

The rubber industry, suffering setbacks due to strikes, has been turning out goods at a record volume. Paper gains have reached points never before experienced and the chemical industry is continuing to expand, setting production records all the while.

While textile output is not up to earlier highs, production is continuing to rise. Food, oil and clothing production likewise are hitting former production peaks.

Pipeline construction is continuing, with many large pipes being laid parallel to existing lines to provide additional fluid transportation facilities for our ever-expanding petroleum industry.

From a long-range point of view, there is no reason to believe that the present boom our nation is enjoying should not continue for years to come. It is a concensus of opinion that should there be any slackening in industrial activities, a huge public works program will be thrown into operation.

Based on expenditures for the past ten years, projected public works construction indicates that over $2 billion is to be spent. This is a spending rate of $10 billion a year—double the amount appropriated for 1955. A major portion of this huge program will be devoted to highway expenditures where welding will play an important role.

With highways under construction throughout the nation, there will be an excellent opportunity for those in welding to sell highway engineers on the installation of modern steel bridges. A few states have adopted programs for welded highway bridges, but there is still much to be done in this field.

The amazing thing about our present boom is that the "prophets of doom," who were so outspoken last year, have again missed. The government has continued to cut defense spending, and business activity has greatly increased.

We now find that there is higher employment, higher wages and better living in a peacetime economy than we experienced during war years.

As this issue went to press, WELDING ENGINEER learned that this past May set a new all-production record for the United States. More goods were produced in that month than in any other in the history of the country.

* * *

We of WELDING ENGINEER research department wish to thank the manufacturers of welding equipment supplies and accessories, National Electric Manufacturers Ass'n., Compressed Gas Ass'n., Resistance Welder Manufacturing Ass'n., American Iron and Steel Institute and others who have so graciously furnished the information assembled to produce the statistics on the opposite page.

Without this assistance, and that given by many whose names must be withheld because of the confidential information disclosed, it would have been impossible to compile this presentation.

Figures for the Facts

How the Dollars Went in the Welding Industry

	1950	1951	1952	1953	1954
Gas Welding and Cutting Industry	$281,266,193	$373,490,595	$374,913,810	$418,042,250	$365,640,643
Arc-Welding Industry	86,919,142	124,902,648	170,022,502	157,589,284	135,933,996
Resistance-Welding Industry	24,201,306	34,094,529	41,794,453	38,153,601	37,321,291
Welding Industry Totals	$392,386,641	$532,487,772	$586,830,765	$613,785,135	$538,895,930

Source: The Welding Engineer Industry Estimates.

How Your Welding Dollar Was Spent

	1950	1951	1952	1953	1954
Arc-Welding Industry					
Machines	$ 26,910,555	$ 32,194,160	$ 41,604,065	$ 36,773,165	$ 33,043,167
Arc Electrodes	49,172,601	78,775,790	111,930,454	104,831,898	87,881,398
Accessories	10,835,986	13,932,698	16,487,983	15,984,221	15,009,431
Gas-Welding Industry					
Oxygen	144,187,832	196,254,013	205,328,703	229,842,689	198,369,000
Acetylene	101,267,948	125,439,987	119,276,095	139,187,436	123,949,000
Gas Totals	245,455,780	321,694,000	324,604,798	369,030,152	322,318,000
Apparatus	25,358,177	34,478,363	32,968,656	29,986,440	26,830,794
Welding Rod and Accessories	10,452,236	17,318,232	17,340,356	19,024,658	16,491,849
Resistance-Welding Industry					
Apparatus, Controls and Electrodes	$ 24,201,306	$ 34,094,529	$ 41,794,453	$ 38,153,601	$ 37,321,291

Source: The Welding Engineer Industry Estimates.

Electrode Production 1938-1954

In Pounds

	Pounds
1938	97,020,000
1939	152,863,400
1940	198,995,000
1941	386,886,131
1942	745,893,457
1943	1,086,784,300
1944	847,937,972
1945	541,829,046
1946	340,029,320
1947	360,098,430
1948	436,359,255
1949	329,596,600
1950	422,287,900
1951	549,327,781
1952	573,376,722
1953	547,614,604
1954	431,263,875

Sources: 1938-40—National Electrical Manufacturers' Association
1941-on The Welding Engineer Industry Estimates.

Electrode Production 1938-1954

In Pounds Per Ton of

	Plates, Shapes and Sheets	Steel Ingots
1938	9.9	3.06
1939	9.1	2.90
1940	10.9	2.98
1941	17.7	4.67
1942	26.4	8.69
1943	46.7	12.22
1944	31.3	9.50
1945	21.9	6.90
1946	16.1	5.10
1947	12.6	4.25
1948	14.9	4.92
1949	15.2	4.25
1950	15.6	4.35
1951	17.7	5.23
1952	22.8	6.15
1953	20.4	4.94
1954	15.4	4.88

Source: The Welding Engineer Industry Estimates.

Welding Wire Production

Electrodes and Wire

	Pounds
1938	117,395,000
1939	183,436,000
1940	237,780,000
1941	425,574,744
1942	803,755,822
1943	1,133,876,000
1944	890,243,721
1945	589,371,842
1946	370,632,958
1947	388,121,600
1948	467,986,321
1949	352,668,360
1950	450,848,053
1951	587,780,940
1952	607,496,832
1953	580,223,145
1954	460,942,721

Sources: 1938-39—American Iron & Steel Institute
1940-on—The Welding Engineer Industry Estimates.

Steel Production in the United States 1938-1954

	Ingots	Tons
1938	31,751,983	
1939	52,797,783	
1940	66,981,662	
1941	82,927,557	
1942	86,029,921	
1943	88,836,366	
1944	89,641,575	
1945	79,701,624	
1946	66,602,706	
1947	84,783,981	
1948	88,533,729	
1949	77,868,353	
1950	96,713,276	
1951	105,134,553	
1952	93,156,375	
1953	111,609,716	
1954	88,311,652	

Source: American Iron & Steel Institute.

	Plates, Shapes and Sheets	Tons
1938		9,797,408
1939		16,492,952
1940		18,107,108
1941		23,342,334
1942		27,488,389
1943		23,219,605
1944		23,498,712
1945		24,681,737
1946		21,396,280
1947		28,492,386
1948		29,215,509
1949		21,670,929
1950		26,983,427
1951		30,826,444
1952		25,498,190
1953		26,889,093
1954		28,002,100

Source: The Welding Engineer Industry Estimates.

The Welding Market 1938-1954

In Dollars Per Ton of

	Plates, Shapes and Sheets	Steel Ingots
1938	5.0	1.83
1939	4.3	1.37
1940	7.0	1.86
1941	8.2	2.30
1942	11.4	3.51
1943	17.4	4.06
1944	17.8	4.14
1945	11.2	3.49
1946	11.8	3.51
1947	10.7	3.64
1948	11.6	4.23
1949	14.4	4.11
1950	14.5	4.06
1951	17.2	5.07
1952	22.3	6.11
1953	22.8	5.59
1954	19.1	6.08

Source: The Welding Engineer Industry Estimates.

Automatic arc control

. . . is claimed for this new magnetic amplifier

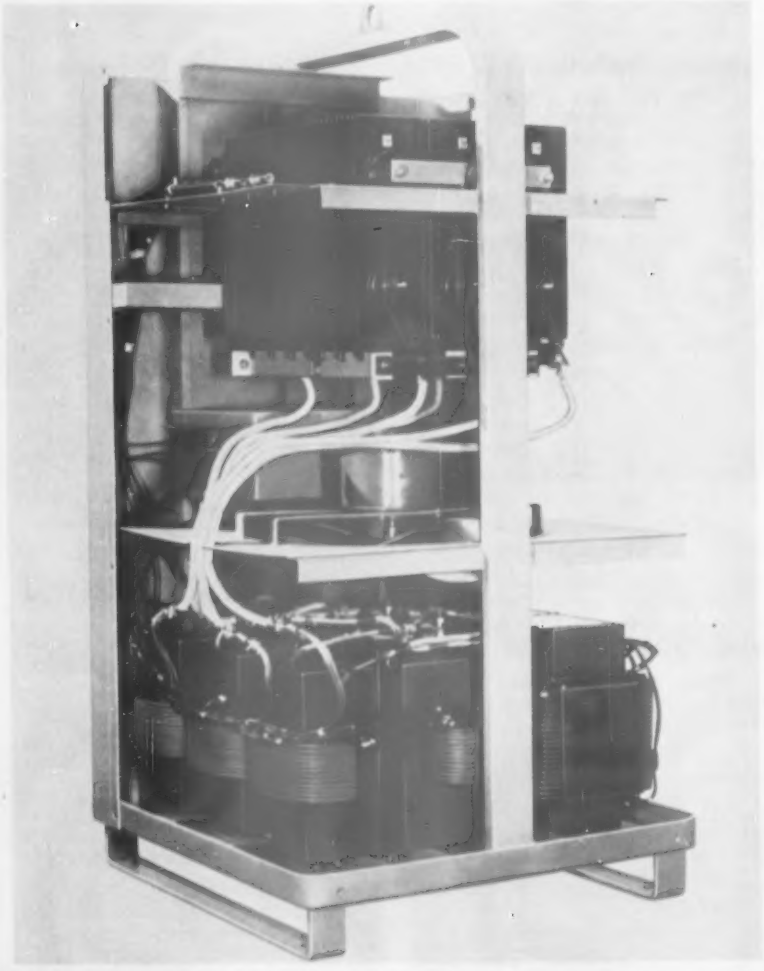
BY CLARENCE BENNETT
Vickers Electric Div.

MAGNETIC amplifier control, a post-war development in the industrial control field, brings a new concept of control to the rectifier-type static welder.

While recognizing the general advantages of static-type welders, many operators on position and code-welding jobs demand the adjustable-voltage characteristic of the motor-generator welder. Unable to obtain a variable volt-amp curve with static-type welders employing saturable or mechanically-adjusted reactors, these operators have continued using motor-generator equipment.

The advent of the magnetic amplifier for welding control, after years of extensive testing in industrial control systems, bridges, we believe, the gap between desirable features of static-type welders and the adjustable-voltage feature of motor-generator welders.

Magnetic amplifiers are inherently suited to producing the adjustable volt-amp curves heretofore obtainable only with motor-generator welders. In addition to providing full, continuous volt-amp control, enabling the operator to select the type of arc strike and welding characteristic he desires for any given welding condition, the magnetic-amplifier welder has the advantage of being a static machine.



INSIDE view of new magnetic amplifier with top cover and "wrap-around" enclosure removed. Arc and resistance welding were employed to give maximum strength with simplified construction

The magnetic amplifier is a magnetic device which amplifies the effect of very small signal currents to control large currents, such as welding current. Although its control effect is similar to an electronic-tube amplifier, the magnetic amplifier has no tubes or moving parts and requires no warm-up.

Resembles Transformer

Fundamentally, a magnetic amplifier resembles a transformer, consisting of two coils of wire wound on a special steel core. One coil, known as the control winding, carries low-current control signals. The large current to be controlled by the signals flows through the second coil known as the output winding.

Special rectifiers in the amplifier circuit limit the flow of the large current through the output winding, in one direction, thereby assisting the control signal in producing the desired setting by modifying magnetic saturation. Thus the name, "self-saturating amplifier."

Therefore, very small signal currents are capable of controlling much larger currents in the output circuit and response to signal changes is faster. In the magnetic-amplifier type welder, the control signal changes result from changes in welding arc.

Features and advantages of magnetic-amplifier control can be seen by comparing the magnetic-amplifier welder with conventional reactor-type welders.

The three basic static-welder types (other than true magnetic-amplifier type) can be classified according to the method of adjusting welding current: adjustable coil type; adjustable

core type; simple, saturable reactor type.

As the names of the first two types suggest, mechanical adjustment of the coil or core determines welding current. Welders of these two types may be of smaller size than other types, but they require mechanical linkage. Remote control becomes more complex.

The saturable-reactor type operates from electrical signals to adjust output and can be simply remote-controlled.

However, large electrical signals necessary to vary output limit the number of signals which may be applied to the saturable reactor. For this reason, the magnetic amplifier, which embodies the principle of self-saturation and thus requires very small electrical control signals, has replaced the saturable reactor in many control applications.

The output current of a saturable reactor obeys, generally, an equal amp-turns relation with the input signal. Therefore, for a given setting, a saturable reactor gives inherently a constant-current or drooping-arc characteristic.

High Amplification

In magnetic-amplifier control, small electrical signals are used to control larger power outputs, giving high amplification. Several small signals may be applied to give an output proportional to the sum or difference of these signals.

Thus, with suitable application of signals, the magnetic amplifier will deliver a steeply-drooping volt-amp curve, similar to that of a differentially-compounded generator.

Modification of the input signal, by feedback of welding output, will give a flat (shunt-generator) characteristic. A proper proportion of signal will give all values between the flat and droop curves.

By means of low-power, simple-control circuits, the magnetic amplifier may assume characteristics of a constant-voltage device. High-surge currents with voltage change give it forceful arc characteristics. The welder feedback control, meanwhile, avoids heavy continuous overshoots. This latter characteristic is noticeable as a difference in "operator feel."

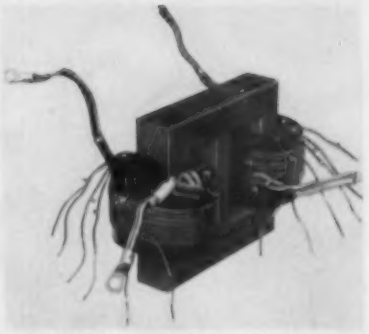
Further features unique to the magnetic-amplifier-type welder are determined by electrical characteristics of the amplifier itself. A magnetic-amplifier reactor unit is designed to give both steeply-drooping and gently-drooping welder volt-amp curves.

This amplifier consists of highly permeable steel laminations and copper output and control windings. In the welder circuit the output windings receive power from the three-phase transformer.

Each phase utilizes a magnetic amplifier reactor unit and one-third of the three-phase rectifier. Since each phase operates symmetrically, the action can be represented by one-third of the total circuit. This gives a single-phase circuit.

The subject of basic magnetic amplifier operation with resistive and inductive loads has been well covered by many authors. The same principles apply to welding arc loads although end results required are different.

The circuit controls output by signals applied to control windings. Total output is determined by the combination of signals from welding arc and basic control voltage.



MAGNETIC-amplifier reactor unit gives both steeply-drooping and gently-drooping welder volt-amp curves

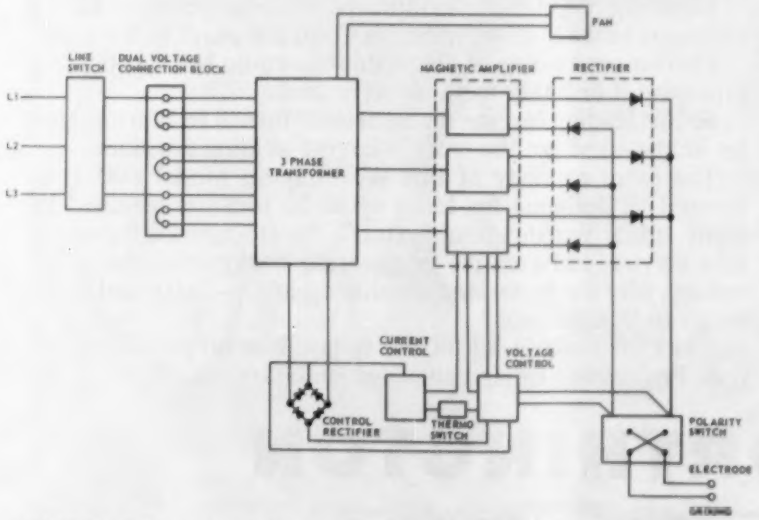
Arc Stability

This curve shows low minimum current obtainable on the linear portion of the characteristic. Such a low minimum current gives excellent arc stability at extremely low currents. High output current inherently obtainable with the same circuit eliminates the need for range switches or taps with the magnetic-amplifier welder.

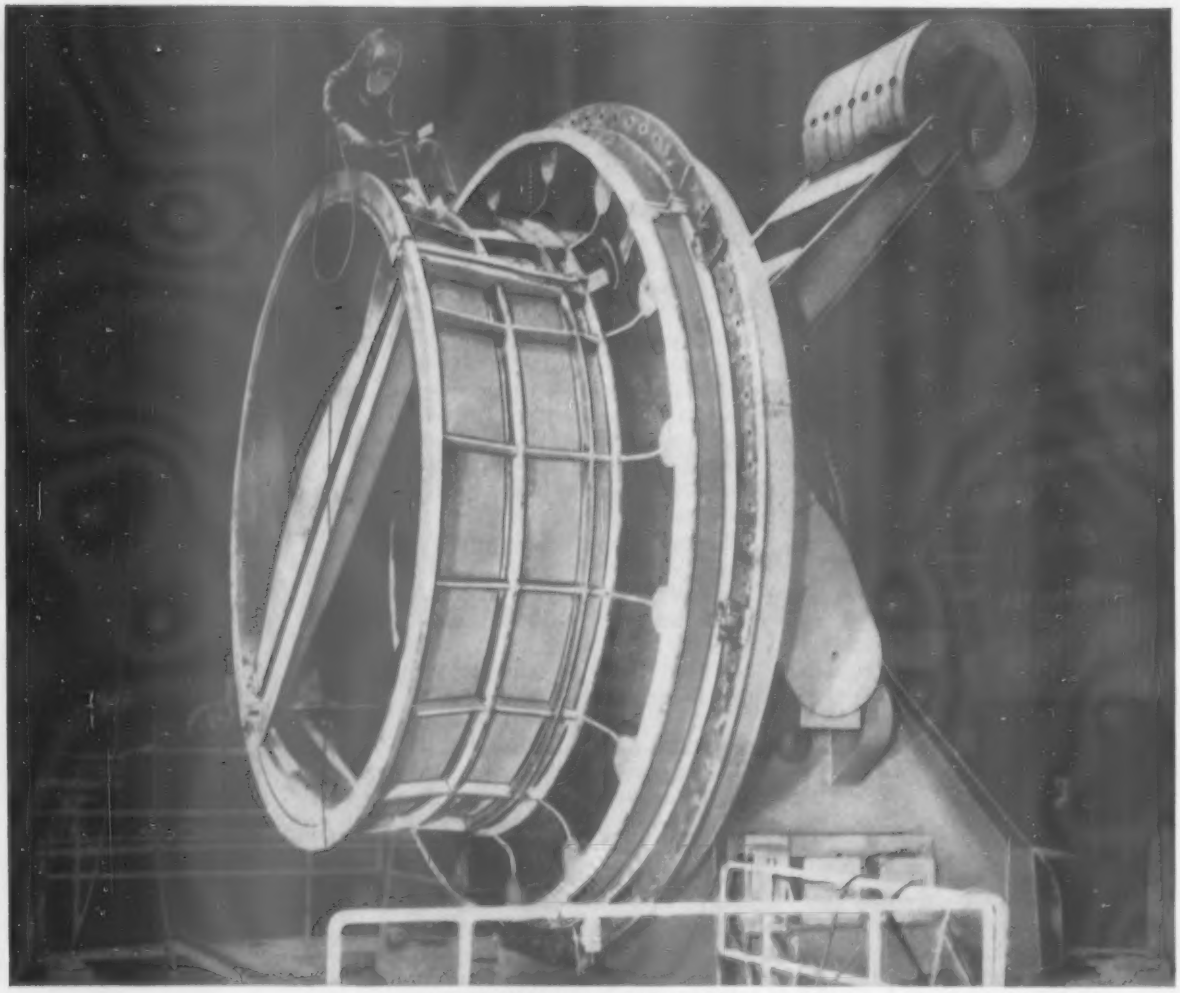
The relation of control amp-turns, output voltage, and current may be shown in a different manner, similar to vacuum tube characteristics. Welder amplifier characteristics can be conveniently represented in a volt-amp plane.

Current surges available for starting are also determined by voltage setting. For a given welding current the start may be made very forcefully, or for thin materials, very softly. The forceful arc characteristics necessary for welding with very short arcs are obtained without a large increase in normally steady current with the magnetic amplifier.

The current and voltage control on the magnetic-amplifier welder permits the weldor to select the characteristic for any job. The current control varies current over the complete range while voltage control adjusts the arc for the particular volt-amp characteristic desired.



BASIC block diagram of the magnetic amplifier welder shows current and voltage controls which permit the weldor to select proper characteristic for any job



DOWNHAND WELDING of huge weldments at the S. Morgan Smith Co. is made easy by automatic Worthington welding positioner.

World's largest welding positioner

Handling 64,000-lb weldments was the problem facing engineers in the S. Morgan Smith Company plant in York, Pa.

Correct positioning of pieces this big would be exceptionally expensive if ordinary methods were used.

So this leading turbine manufacturer turned to Worthington for help — and got the world's largest welding positioner.

The extra capacity of this Worthington Model 600 Positioner (it's designed for loads up to 50 tons) is matched by many other Worthington "extras". Worthington's top-notch field service and creative engineering background are more reasons why the *important* positioning jobs — large and small — go to Worthington.

Write for Bulletin R1700S11 today. Worthington Corporation, Positioning Equipment Division, Harrison, N.J. Y-8.1

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THANX TO BOB KIDD - HERMOSA BEACH, CAL.
ON A HEAVY CUT, WHERE WILL THE OXYGEN PETER OUT?
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HERE? ...NOOO
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NWSA convention theme . . .

LIFE of a salesman

BY F. T. TANCULA

SPARKLING speeches, a record attendance and some fine social events. That's a quick resume of the 11th annual convention of the National Welding Supply Association, held May 18-20 at the Edgewater Beach Hotel in Chicago.

The guest speakers were probably the highlight of the meeting. The majority of them retained the rapt attention of their listeners and proved highly entertaining. But their humor was such that it did not camouflage the "meat" of their respective topics.

The total registration for the convention was 564—425 men and 139 ladies. This bested the old record of 412. At convention time, NWSA membership was at an all-time high —435 distributors and manufacturers.

The social events, consisting of several cocktail parties, a dinner dance, and the ladies' program were well attended.

BROWN: "Women are more interested in people than in things"

MARTIN: "The human element is what counts—men make the difference, not the product"

Caluwaert New President

E. C. "Eddie" Caluwaert of O. K. I. Welding Supply Co., Cincinnati—to the surprise of practically no one—was elected president of the organization for the coming year. He succeeds James N. Alcock, Saginaw Welding Supply Co., Saginaw, Mich.

Elected zone vice-presidents were the following:

A. C. Axtell, Essex Welding Equipment Co., Inc., Newark, Eastern Zone; L. P. Beaver, Jr., Beaver Welding Supply Co., Memphis, Southeastern Zone; Raymond P. Tarbell, Scott-Tarbell, Inc., Cleveland, Central Zone; C. S. Rutherford, R & R Welding Supply Co., Des Moines, West Central Zone (re-election); Paul E. Haygood, Louisiana Welding Supply Co., Baton Rouge, La., Southwestern Zone; and Harry Moore, Moore's Welding Supply, Sacramento, Calif., Western Zone.

Ogden C. Mills, Mills Welding Supply, Inc., Buffalo, was elected a director for a term expiring in 1956. He fills the vacancy left by Mr. Axtell's election to the vice-presidency.

Stanley H. Keen, Keen Compressed Gas Co., Inc., Wilmington, Del., was named a director until 1957, to fill the unexpired term of Carl W. Berner, Welders Supply, Philadelphia. Others named to the board (all terms expiring in 1958) were:

W. E. Cooper, Baker's Welding Supply Co., Bakersfield, Calif.; Reid Jones, Jr., Jones Welding Supplies, Roanoke, Va.; Howard R. Proctor, Acme Welding Supply, Inc., Houston; and H. R. Shannon, Capital Welding Supply Co., Little Rock, Ark.

NEW president of NWSA is E. C. Caluwaert.

In his president's address on the morning of May 18, Mr. Alcock traced the growth of the National Welding Supply Association during the past year and expressed his opinion that "our progress is unlimited."

The Salesman

The welding supply business is, after all, a selling business. Therefore, the theme of this 11th annual NWSA convention was "The Life of a Salesman." Subjects touched on by speakers ranged from the selection of a salesman to how to keep his wife happy.

Guest speakers Wednesday morning were Arthur C. Horrocks, The Goodyear Tire & Rubber Co., Inc., Akron, Ohio; Verne Martin, sales consultant, Newton, Iowa; and Dr. Robert N. McMurry, McMurry, Hamstra & Co., Chicago.

"Hungry men will never be peaceful men" was a thought expressed by Mr. Horrocks as he told his audience that the core of world problems is hunger. Despite the dangers to peace, he felt "we were born at the right time and place . . . for the greatest surge of civilization."

"Men make the difference" was Mr. Martin's thesis. A former sales executive with the Maytag Co., he outlined that firm's program for procuring and training sales personnel.

Dr. McMurry, a psychologist and sales consultant, discussed the factors in selecting salesmen.

On Thursday, May 19, a panel of six men tackled the problem of how to increase sales in a buyer's market.

Proper displays were discussed by

Ogden Mills and Wilson M. Jones, Bay State Abrasive Products Co., Westboro, Mass. R. G. Harrison, Welders Supply Co., Little Rock, and Byron Helms, Victor Equipment Co., San Francisco, spoke on effective advertising. Product knowledge was the subject of talks by C. S. Rutherford and D. R. Warner, Miller Electric Mfg. Co., Inc., Appleton, Wis.

Unlike many such discussions, this one evoked numerous questions and comments from the floor.

Sell the Benefits

Following the panel discussion, Cloyd S. Steinmetz, Reynolds Metals Co., Louisville, Ky., spoke on "Creative Salesmanship." Punctuated with many specific examples of such salesmanship, his talk suggested that what people want is not products or services, but the benefits to be derived from such items.

The Friday morning line-up of speakers was as interesting as the previous days. A. C. Van Dusen, Northwestern University, Evanston, Ill., spoke on the use of psychology in selling. "People do differ from one another, but conflicts arise readily when these feelings are vastly different," he said.

"The Salesman's Wife" was the title of a talk given by Miss Phyllis Brown, The Research Institute of America, New York City. Having a woman as a guest speaker was a great departure from the norm—it was, in fact, the first time for NWSA. Miss Brown's lively "exposé" of how the wife of a salesman feels toward his job and how she feels *she* should be treated was well received by the ladies as well as the men.

Her main thesis: the employer is not tapping the tremendous potential of influence his employees' wives have over their husbands.

PANEL discussion: Proper displays, effective advertising and product knowledge are important considerations in trying to increase sales in a buyer's market

Probably the liveliest and most humorous of all the speakers was Fred Smith, The Gruen Watch Co., Cincinnati, whose address was entitled "Selling—An Interesting Way to Live." His anecdotes, delivered in a Southern drawl, had the audience roaring during most of his talk.

As they say in show business, Miss Brown's act was a tough one to follow, but Mr. Smith more than held his own.

Guest speaker at the annual banquet was Dr. John O. Christianson, superintendent, School of Agriculture, University of Minnesota, St. Paul. Faith in our nation was the gist of his talk on "Rediscovering America."

At this dinner, gavels were presented to all of the Association's past presidents.

The sixth annual contact booth program, conducted two afternoons, was another highlight of the affair. Represented were 88 associate members (manufacturers).

Five applications for active memberships and seven for associate memberships were received during the convention.

Next year's meeting will be held March 19 through 22 in New Orleans. The Hotel Roosevelt will be convention headquarters.

SMITH: "It is best to 'wait to worry'"

STEINMETZ: "Creative thinking—creative work—is the order of the day"

VAN DUSEN: "The need for a little attention and affection is great among people"

McMURRY: "The process of selection is a prediction—will he or will he not be a successful salesman?"

CANADIAN Minister of Public Works, Robert H. Winters, chats with executive members of the Canadian Welding Society. Left to right, they are: J. M. Gulley, A. S. Tuttle, J. A. Brown, Mr. Winters, M. N. Vuchnick and Dr. J. Convey

1st welding convention

Canadians convene

WELDING has played a top role in Canada's industrial development. This was the theme developed by the Hon. Robert H. Winters, Canadian Minister of Public Works, in a speech before delegates to the first convention of the Canadian Welding Society.

The Society met on June 6 and 7 in Toronto during the Canadian International Trade Fair, and announced that the meeting will become an annual affair. More than 250 delegates from all parts of the country attended, Quebec and Ontario being most heavily represented.

Fifteen major technical sessions were held for Society members, and a special welding exhibit was on display throughout the Trade Fair.

Speaking at the President's banquet, Mr. Winters, a former practicing engineer, said, "It would be difficult indeed to touch on any phase of production, involving the use of metals, in which welding does not play a prominent role."

Mr. Winters showed his audience the major share welding had contributed to the new industrial Canada, and pointed out that Canada and welding actually have "grown up" together, since new welding practices are as recent as Canada's international stature.

Also speaking during the course of the Society's convention were C. H. Elsley, S. A. Agnew, W. P. Campbell, M. J. Nolan, P. M. Howard, D. Willcox and Professor James Scott.

Mr. Elsley, representing Dominion Foundries and Steel Ltd., spoke on the subject, "Submerged-Arc Welding in Steel Mill Construction and Maintenance."

Welding instruction was the topic of Professor Scott of the Ontario Agricultural College, where 1,450 students have received basic welding training over the past eight years.

A joint paper disclosing the results of their experience with resistance welding of high nickel and other high-temperature alloys was presented by Mr. Howard and Mr. Willcox. Both men represented Rolls-Royce of Canada, Ltd.

They pointed out that "improper welder settings cause a variety of defects, with the result that given alloys are considered unsuited for resistance welding."

Mr. Agnew discussed new discoveries in the causes of "Brittle Failure," and Mr. Campbell and Mr. Nolan, both of the Department of Mines and Technical Surveys, disclosed "Some Interesting Welding Investigations."

At the banquet closing the meeting, past president E. A. Gill of Toronto presented a gavel to new president R. F. Scott of Fort Erie.

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Chicago Heights, Ill.

PLASTIC weld process speeds fabrication of acid-proof liner inside steel tank

Temperatures are lowered, visibility unobscured, fumes virtually eliminated. Yet work quality is maintained, claim plastic welding pioneers

Plastic welding comes of age

BY J. A. NEUMANN*

THERMOPLASTICS that soften under heat now can be welded either with gas or electric equipment. Successful uses for them have been found in the chemical and food industries, in laundries and breweries, and wherever acids and strong alkalis are present.

The development of metal welding and welding of plastics have much in common. Both were developed by the trial-and-error methods of practical men who frequently had no scientific background. Unaware of the immense difficulties facing them, they simply went ahead and solved their problems with common sense applications.

This is one reason why some earlier failures can nowadays be avoided, although even today an explanation is not always available to satisfy an inquisitive mind.

Public knowledge of plastic welding dates back to 1937, when R. C. Reinhardt was issued a patent describing a method for welding thermoplastics using a hot-gas welding gun.

At about the same time, A. Henning of the I. G. Farbenindustrie in Germany also found that thermoplastic materials could be welded. His patent application was filed on May 1, 1938, and granted on Aug. 12, 1943.

A comparison of the two patents reveals that both inventors apparently had the same idea, even to minute details. But, incredible as it may sound, no use was made of Reinhardt's discovery.

Henning's work, on the other hand, was crowned by success, and he was given credit thereafter for making gas welding of plastics an accepted method of fabrication.

Gas welding of plastics in the United States came of age a few years ago when pioneers in the field discovered that all-plastic assemblies could be extended almost to an infinite degree by the process of welding. Welding also offered a means of producing shapes otherwise unobtainable, and of repairing and rebuilding damaged thermoplastic components.

ROUND filler rod, held vertically, makes smooth, even deposit

Among weldable thermoplastics, polyvinyl chloride and polyethylene were of initial and lasting importance.

Equipment

Plastic welding equipment consists of a hot-gas, or "flameless," torch operated by gas or electricity, a pressure regulator and a filler rod. The gas-welding torch permits temperature regulation of the hot-gas or air stream by varying the flame which heats the coil.

Temperature of the stream may be further regulated through gas pressure, and by varying distance between torch tip and weld piece. Temperature at the orifice should be between 400 and 600 F.

Regardless of welding gas used, whether compressed air or a neutral gas, a pressure regulator is necessary to control the flow of gas through the gun to the weld piece. The regulator permits continuous flow at constant pressure of 5 to 10 psi. Approximately 2 to 1.0 cu ft of heated gas are used per minute of welding time. If compressed air is used as the hot gas, a filter is necessary to remove moisture and oil from the air. The combination of filter and regulator, used widely in spraying work, is ideal and readily available.

Welding filler rods should be of the same material as the plastic to

*President, American Agile Corp., Bedford, Ohio. This article is based on a recent talk given by the author.

ONE wide-range "OXWELD" W-45 BLOWPIPE handles EVERY welding and heating job

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NO OTHER SINGLE BLOWPIPE OFFERS THIS *EXTENSIVE RANGE!*

Anyone whose daily work includes welding and heating will readily appreciate the amazing wide range and versatility of the new OXWELD W-45 Blowpipe. Its 18 head sizes (2 to 300 cu. ft. per hr. capacity) provide a perfect flame for every metal thickness. Light sheet to heavy plate, *one blowpipe does it all!*

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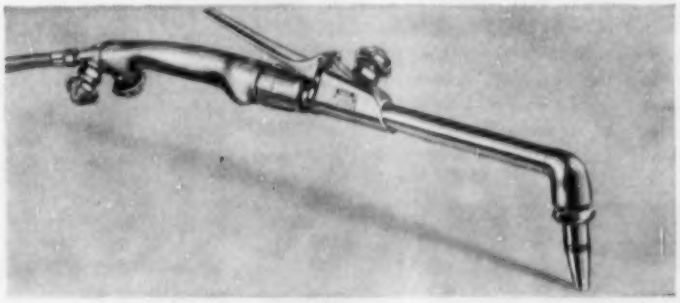
See for yourself how you can enjoy tomorrow's operating standards today with an OXWELD W-45 Blowpipe. Ask your LINDE representative for a demonstration, or write for free booklet, F-8684.



CW-45 Cutting Attachment adapts the W-45 Blowpipe for cutting steel up to 8 inches thick.

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be welded. Sometimes a rod slightly more plasticized than the material to be welded is best because it gives greater control over weld contour. However, welds made with plasticized filler rods usually show a slight reduction in chemical resistance and a small loss of dielectric strength.

Diameter of the filler rod varies from 1/16 to 3/16 in., depending upon size and type of weld desired, ease of access to joint, and size of gun. A round rod with a constant diameter is preferred since it makes a smooth and even deposit and permits steady application of pressure.

Welding guns have replaceable tips so that the orifice can be varied from ⅛ to ¼ in. A slight bend near the gun nozzle tip provides more convenient welding positions during operation, but on some jobs a straight tip may be more desirable.

Plastic welds resemble types produced by electric arc welding. For the fillet weld, no preparation is needed. For the butt weld, the two pieces are bevelled by sawing, filing or grinding as in arc welding.

The prepared surfaces should be clean and roughened with a scraper to improve the welded bond. A sealing run on the reverse side of the butt weld insures higher tensile strength.

Welding Process

One essential difference between metal welding and plastic welding lies in the joining of filler rod and parent material. Complete fusion of the two is characteristic of arc welding. With plastics, however, a simple bonding process takes place, since only the actual meeting surfaces melt; the other parts remain relatively unaffected and rigid.

The slight pressure applied to force the filler rod into its "bed" (a pressure not unlike that needed in resistance welding, or in the old blacksmith's forge-welding process) combines melted surfaces into one homogeneous mass. In this manner, a bonded, integral weld is produced.

To produce uniform coalescence, the torch should be used to pre-heat surfaces or edges to be welded, as well as the filler rod. The filler rod cannot adhere if surfaces have not been sufficiently pre-heated and melted. Since overheating causes darkening of the material and too much sub-surface melting, preliminary heating of the filler rod should be confined to an area about ½ in. from tip of rod.

Two variable factors make it possible to adjust the process to particular properties of plastic to be welded. These factors are amount and kind of pressure applied to filler rod, and angle at which welding takes place.

To weld polyvinyl chlorides, filler rod should be almost perpendicular to weld piece, while for softer polyethylenes the angle should be 45 deg.

A slight weaving motion of the hot gas stream prevents under-cutting. Should failures occur due to underheating or overheating, affected parts of the weld must be removed before welding continues. With relatively thick, multi-layer welds, single beads should be deposited to obtain continuous contours, and a final sealing run should be made.

The easiest manner of welding is, of course, the downhand position, yet welding in a vertical or overhead position presents no difficulties if there is freedom of manual movement. To determine soundness of weld and thoroughness of surface bonding the operator may attempt to pull the end of the welding rod from the welded piece after the weld has cooled completely. In a good weld, the filler rod will tear off at the end of the weld; a poorly made weld will allow the rod to be pulled out of its bed.

THERMOPLASTIC construction results in handsome, self-supporting tank with snugly-fitted dipping basket

Testing The Weld

Faults arising from overheating, insufficient bonding and porosity in filler rod will affect quality of weld. They may be detected by the manual test described above or by visual inspection, either under a spotlight, with a magnifying lens, or by holding the weld against light. Since the faults will be due largely to inexperience of operators, they can be overcome with adequate training.

The tensile strength of welded plastic in butt welds averages 90% of parent tensile strength. Figures for fillet welds are somewhat lower, but reinforcements will give sufficient strength in most cases.

A weld will attain full strength in two to six hours, depending upon the size of material and type of weld.

The similarity between metal welding and welding of plastics makes it easier for weldors familiar with the former technique to master this new skill. Less extreme conditions in plastic welding—virtual absence of fumes, unobstructed visibility, and lower temperatures—aid proficiency after a reasonable training period. Training programs similar to those for arc welding may be instituted without unusual difficulties.

HEAVY-duty tank provides durable thermoplastic construction for 1,100-gal capacity

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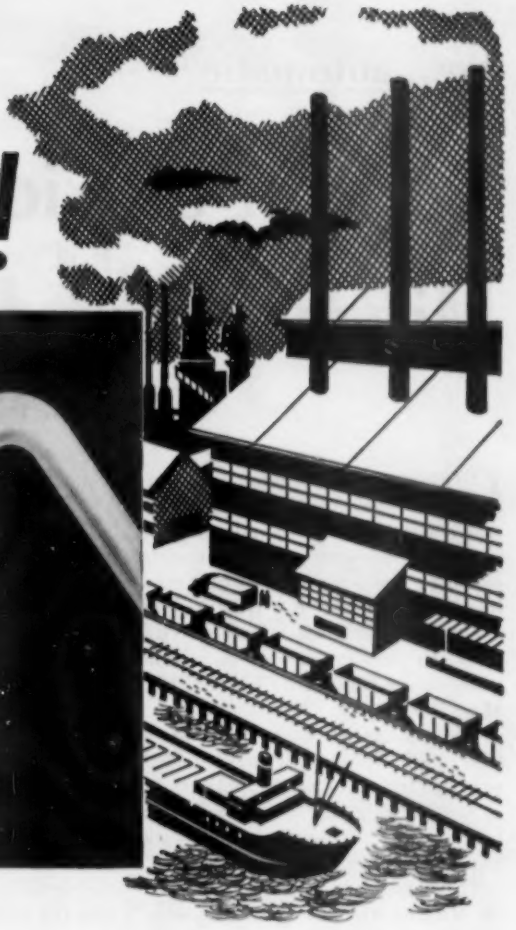

HARRIS SUPER-HEAT TORCH NO. K23

Heat is the Prime Factor utilized in connection with innumerable Metal Working Operations. While it is a fact that the Oxy-Acetylene Welding Torch is universal in its applications, there are many Operations requiring a much greater volume of Intense Heat than can be obtained from a Welding Torch.

A definite limitation exists relative to the amount of Oxygen and Acetylene Gases which can be safely mixed without danger of the Flame "Back-firing", due to the extremely fast Flame Propagation Characteristics of such Gas Mixtures. On the other hand, much larger volumes of such Fuel Gases as Propane, City Gas and Natural Gases can be safely mixed with Oxygen on account of their lower rate of Flame Propagation. It is evident the larger the volume of Gases mixed, the greater the Flame and resulting Heating Value. This produces the truly phenomenal results achieved by this Harris Super-Heating Torch.

The applications of this Harris Torch are unlimited, where large volumes of Intense Heat are required, either as a Portable or Stationary Unit. In places where Massive Shafts are to be Straightened; Large Size Pipe Bent; Flanging or Straightening of Steel Plates; Brazing Heavy Copper Pipe, etc., etc., this Harris Torch, with its **TERRIFIC HEAT**, is the answer.

HARRIS 1903 50 1953 ANNIVERSARY

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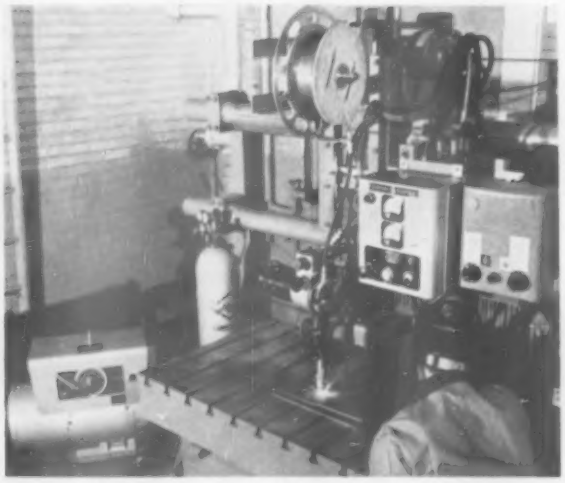
New, automatic

Carbon dioxide Mig welder



DEVELOPMENTAL model of the Mig (metal inert-gas) welder using carbon dioxide gas performs during a test run

COMPLETELY new, automatic, consumable-electrode welding equipment that is especially adapted for use with low-cost carbon dioxide shielding gas is now being produced by General Electric Co.

GE is one of several firms to make such an announcement in recent months (see WELDING ENGINEER, May, 1955; June, 1955).

The equipment constitutes a practical method of using gas-shielded welding for mild steel applications at costs which may be the same or below those for the submerged-arc process.

The requirements of carbon-dioxide welding are such that it must be done at fast traveling speeds, with a short, controlled arc, and done automatically to assure uniform results of highest quality.

In general, satisfactory consumable-electrode inert-gas welding, regardless of material or shielding gas, depends on holding an arc of constant length which will not be affected by charges in wire speed. The arc length that varies out of prescribed range will result in "stubbing" or "burnback."

Stubbing, which occurs in the region of short arcs, is a condition of frequent short circuits, spatter and generally unsatisfactory welding. Burnback occurs in the region of long arcs. The arc stretches back and touches the nearest metallic part of the welding head, creating an arc from this point to the work-piece. It may fuse and damage the welding head or gun to the point of replacement.

Besides stubbing and burnback, arc length also affects penetration, bead contour, spatter, weld quality and speed, undercut and porosity.

Control Arc Length

To insure satisfactory welding results, the proper variable to control is not arc voltage but arc length. This held true for all combinations of electrode wire and shielding gas investigated in the G-E welding process laboratory.

To secure a constant arc length for a particular welding job, a "rising" volt-amp characteristic is necessary in the welding generator. This means that the voltage must be so regulated that it increases as the wire-feeding speed increases, or vice-versa.

The new G-E automatic equipment is designed to function in accordance with the principles described above. It consists of a wholly new automatic wire feeder, welding torch, reel mount and control panel, all of which are designed and integrated for use with the rising volt-amp generator.

Instead of current and voltage, adjustments are made for wire-feeding speed in inches per minute and arc length. Arc length is set on the welding generator to accord with wire size, material welded and shielding gas.

The second variable to be controlled is wire-feed speed. Set on the combined control panel and operator's station, it may easily be changed by the operator without interruption to welding.

Because of the small-diameter electrode wire and high current densities that are employed in this type of welding, feed speeds and burn-off rates must be several hundred ipm.

For stable welding conditions, burn-off rate of the wire must equal its feeding speed. The burn-off rate (feed speed) is almost directly proportional to current and is little affected by changes in arc voltage.

Welding Generator

The welder has a very low open-circuit voltage—between 10 and 30 volts. As welding current increases within the welding range, the voltage generated also increases—a new innovation.

Several different output curves are provided, which substantially match all the slopes of volt-amp curves for varying combinations of wire and shielding gun. No current calibrations appear on the dial since this machine is not intended for ordinary arc welding with flux-coated electrodes.

The operator first selects the proper output curve by means of a tap switch and then adjusts a dial calibrated in terms of arc length. The arc length is adjusted by positioning the selected-output curve higher or lower by means of a field rheostat, which changes the open-circuit voltage.

A chart supplied with the welder gives recommended output curves and arc lengths to accord with size and material of welding wire, gage thickness, nature of workpiece and type of shielding gas.

The generator is designed to give constant arc length and will supply any current required up to its full rating on any setting. The process is wholly self-regulating. In order to weld, either automatically or manu-

NEW Arc Welding System using Murex® CROLOY Electrodes

for Welding CHROME-MOLY STEEL used in HIGH TEMPERATURE — HIGH PRESSURE SERVICE

- **PRODUCES JOINTS AS DEPENDABLE AS THE METAL YOU WELD**
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- **SAVES YOU TIME AND MONEY**

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M & T now brings you a new arc welding system using Murex CROLOY electrodes for fabricating and repairing chrome-moly steel equipment used in high temperature—high pressure service.

For years one of the nation's foremost producers of power piping and high pressure boilers has been using CROLOY electrodes in production. Their experience has proven the excellent operating characteristics of the electrodes, the dependability of the welds under high temperatures and pressures, the economy of the welding system.

With the new system you can greatly simplify preheat and postheat operations . . . you can practically eliminate underbead cracking, forget about costly defective welds . . . you can dispense with stress relieving on many weldments . . . you can weld chrome-moly steels more economically.

Murex CROLOY is a chrome-moly weld metal of outstanding stress rupture characteristics and high ductilities over a wide range of temperatures. Further information is available on this new welding system and the unique electrodes that have made it possible. Just write, or have a Murex man call.

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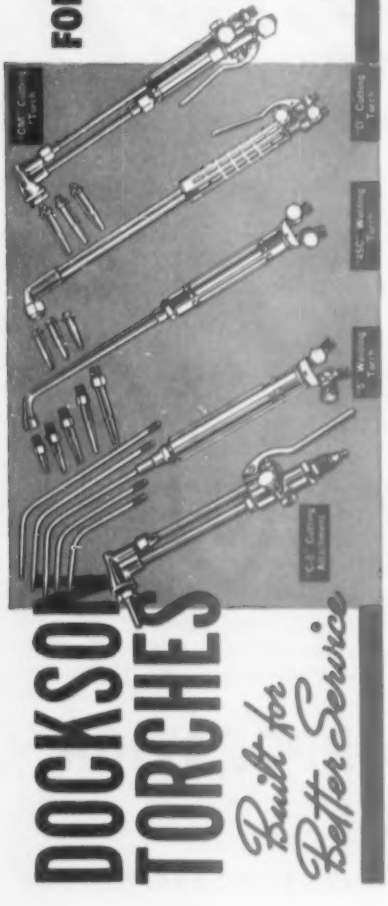

DOCKSON TORCHES
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ally, all that is necessary is to feed the wire at a constant speed.

Correct current is provided to burn off the wire at the exact rate at which it is being supplied. Furthermore, the welder does this at a constant arc length as wire speed is adjusted. Weld quality is unaffected by line-voltage fluctuations since the generator automatically compensates for the variable.

Wire Feeder

The new wire feeder is mountable at two angles and may be rotated across the seam a full 360 deg. A vernier provides for fine adjustments of the cross seam. The feeder has twin driving rolls that are rubber-insulated and require no adjustment.

One model of wire feeder will handle any size of electrode wire within a range of 0.020 through 0.078 in. at feeding speeds up to approximately 1,000 ipm. Another model of wire feeder handles larger wire sizes, ranging from 0.062 through ⅛ in., at speeds up to approximately 600 ipm.

When crater filling is done, the feed rolls slow down automatically as regulated by the control panel. The motor for wire feed and travel is wholly enclosed in a louvered housing.

The 12-in.-long welding torch is water-cooled and has a maximum current capacity of 800 amp. The nozzle is designed so that it may be split in two parts, permitting ready replacement of copper contact tip or a quick shift to a heavier contact tip to handle larger wire sizes.

Nylon liners guide the wire for low-friction feeding and keep the wire well insulated so that its only contact is with the copper tip and feeding rolls.

The reel mount takes 25-lb spools of wire or, with an adapter, will handle rim-mounted wire. A universal mount, it rotates in either direction and has an adjustable brake. A cover is provided to keep dust from getting on the welding wire.

The single control panel also does duty as an operator's station. It includes a dial calibrated for wire speed in 1,000 increments of one ipm, start and stop buttons, a voltmeter, an ammeter and a knob to adjust the degree of crater filling. Arc length is set on the welding generator, as explained previously.

After the dial has been set for desired speed, the operator presses the start button. He holds the button down for a few seconds, while a gas purge valve flushes out air from the system. When he releases the start button, the welding head starts to feed the wire at the preset speed.

Current, shielding gas and cooling water are provided automatically. When the end of the seam is reached, the operator presses the stop button. To secure an automatic crater fill, he merely holds the stop button down for a few seconds.

Travel and feed speed slow down to zero while the current gradually declines as a resistor drains off the charge of a capacitor. The time in which the charge is drained for crater filling is easily adjusted by means of a knob on the control panel.

The simple circuit of the control panel consists of only one relay and three electronic tubes. One tube controls the armature, one the field, while the third holds the speed constant under line voltage changes, heating or amount of load on the wire.

Signals are supplied automatically to gas and water valves, travel speed and contactor circuits. A threading circuit enables the wire to be fed through the nozzle without gas or power.

Should an accidental overload on the feeding motor occur, an automatic reset overload relay shuts off the motor within 15 seconds. The ammeter and voltmeter are provided to show the actual welding current and voltage for record purposes.

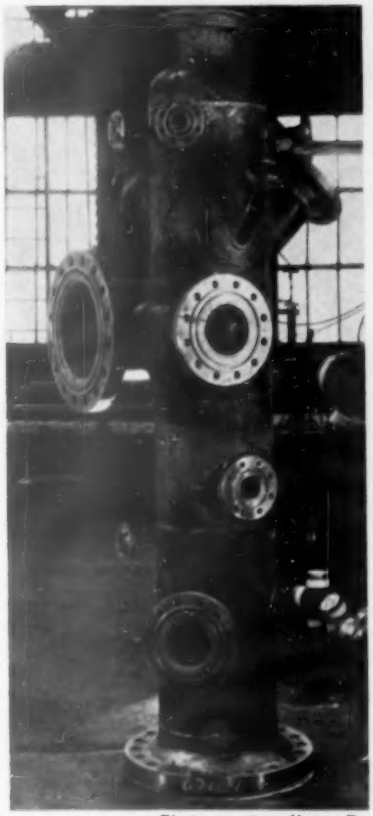
The new control equipment may easily be adapted to multiple welding jobs. A number of welding heads may be operated from one master control panel. The feed speeds and travel may be independently controlled for each of 10 or 15 welding heads, the only limitation being that all welds must start and stop at the same time.

"JUST WHEN ARE YOU REPLACING THAT BROKEN WINDSHIELD?"

HUSKY Products Corp. of Cincinnati, Ohio, reports production of aluminum and steel support systems for power cables at new top speeds and high quality through use of the Tig (tungsten inert-gas) welding process. Porosity-free Tig welds take only 15 seconds and require no finishing

A MANUFACTURER of welding rods and electrodes saved valuable tons of badly bent, short lengths of steel wire with this Mackintosh-Hemphill rotary straightener. Formerly scrapped, short pieces can now be straightened for treatment in extrusion press

on the job . . .



—Photo courtesy Crane Co.

SPECIALIZED welding skills produced this unusual assembly. With 12 welded nozzles ranging in size from ¾ in. to 12 in., this unfired pressure vessel was built to take pressures up to 165 lb per sq in. at 750 F

—Photo courtesy Linde Air Products Co

MOUNTING a mobile tack-welding machine overhead, the Boeing Airplane Co., Seattle, eliminated the need for two additional units and provided service for 16 to 24 welding jigs in a 1,200 sq ft area

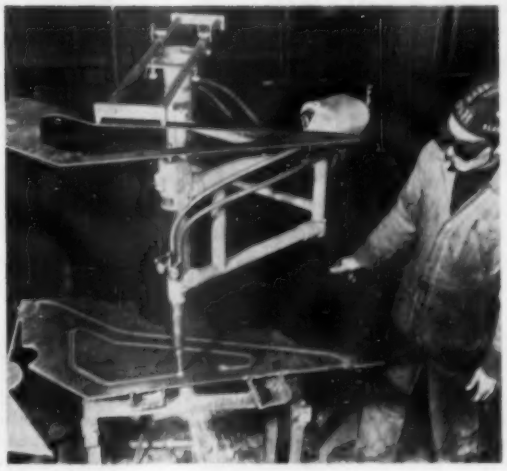


PLATE being flame-cut by automatic assembly is tack-welded at front end only, and no distortion is experienced. Tracing head is in the same centerline as the cutting orifice of the torch

(Photo courtesy Heath Engineering Co.)

Reducing welds with straight wheel

Blending welds with depressed center wheel

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announced by A. O. Smith

medium carbon steels automatically . . .

new gas-shielded metal arc process uses Carbon Dioxide to shield the arc

ON GAS ALONE **in one year's time (3 shifts per day, 260 days), a single C-OMATIC unit saves you *$14,902.00 over Argon, $15,367.00 over Helium.***

● **NEW ECONOMY** thanks to use of less-costly Carbon Dioxide . . . thanks to low maintenance requirements of functional design.

● **X-RAY QUALITY WELDS** — Strength and ductility — yours with C-OMATIC.

● **VISIBLE ARC** means faster, easier welding . . . quick, convenient spotting of nozzle. (When required, C-OMATIC is easily convertible to submerged arc, too.)

● **DEEP PENETRATION** further assures high quality welds. No slag to remove . . . no flux to clean up.

● **ACCURATE CONTROL SYSTEM** of constant current design maintains preset arc voltage without fluctuation. No complex electronic circuits! Auxiliary controls available.

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Chart illustrates astonishing savings

	HELIUM	C-OMATIC	YOUR SAVINGS		ARGON	C-OMATIC	YOUR SAVINGS
Gas consumption per hour	70 cu. ft.	30 cu. ft.	40 cu. ft.	Gas consumption per hour	60 cu. ft.	30 cu. ft.	30 cu. ft.
Cost of gas per cu. ft.	$0.067	$0.01	$0.057	Cost of gas per cu. ft.	$0.09	$0.01	$0.08
Cost of gas per hour	$4.69	$0.30	$4.39	Cost of gas per hour	$5.40	$0.30	$5.10
Cost per hour 60% of duty cycle	$2.81	$0.18	$2.63	Cost per hour 50% of duty cycle	$2.70	$0.15	$2.55
Cost per day (3 shifts, 22.5 hours)	$63.20	$4.05	$59.15	Cost per day (3 shifts, 22.5 hours)	$60.80	$3.38	$57.42
Cost per year (260 days)	$16,420	$1,053	$15,367	Cost per year (260 days)	$15,780	$878	$14,902

GET ALL THE FACTS NOW! Write for free booklet describing C-OMATIC in detail. Welding Products Division, A. O. Smith Corporation, Milwaukee 1, Wisconsin.

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WELDING PRODUCTS DIVISION
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702-3C
Fiberglas* Welding Helmets

706-3C

These seamless all-plastic helmets are light, exceptionally strong, moisture proof, non-warping, heat resistant and easily sterilized. A new type "S" four position stop provides a strong, simple and quick adjustment for the individual wearer. No. 702-3C supplied with No. 1085 Insulated Steel Glass Holder. Includes Filterweld Plate and Clear Cover Plate. No. 706-3C has No. 1096 Insulated Dowmetal Lift-Front Glass Holder.

*Reg. T.M. Owens Corning Fiberglas Corp.

1245B-2
Straightaway* **SOUND PROTECTORS**

A real advance in muffling industrial noise. Increases efficiency, cuts compensable claims. Effective in both low and high frequency ranges. Headband type shown is for "on and off" or moderately lengthy use. Adjustable padded headband spring. "No-metal" connection unit. Designed so cups stay snugly, comfortably in place.

(Headband type with built-in earphones also available. Also helmet types)

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Cuts absenteeism due to dermatitis. Protects workers' skin all day — washes clean in a jiffy. Mildly antiseptic. Contains lanolin. For protection against cutting oils, lubricants, paints, etc. Available in jars and tubes.

851 Heavy Duty Cleaning Station

For coal mines, foundries, packing houses, canneries. Use for plastic goggles, safety shields, any protective surface. Fluid is pressure packed. No pump, fuss or mess. Very economical in use. 20 gauge steel container. Pilfer-proof. Provides for tissue disposal. Unit consists of dispenser, cleaning and anti-fog fluid and jumbo size filling of paper.

850 Magic Lens Tissue (Silicone Treated) and Compact Dispenser

Steel dispenser can be installed on any smooth surface. The handy, thrifty way to keep glasses clean, clear, polished. Tissue is strongly tear-resistant, sheets are 50% larger than customary. Comes with 6 packages of tissues.

750 Lens Cleaning Cabinet

Wood. 12″ long, 9″ deep, 6″ high. Has all necessary cleansing and anti-fog materials. Simply attach to wall. Comes with 120 cleaning tissues, 1 oz. jar of AO Anti-Fog, 6 oz. bottle and sprayer. Order lens fluid separately.

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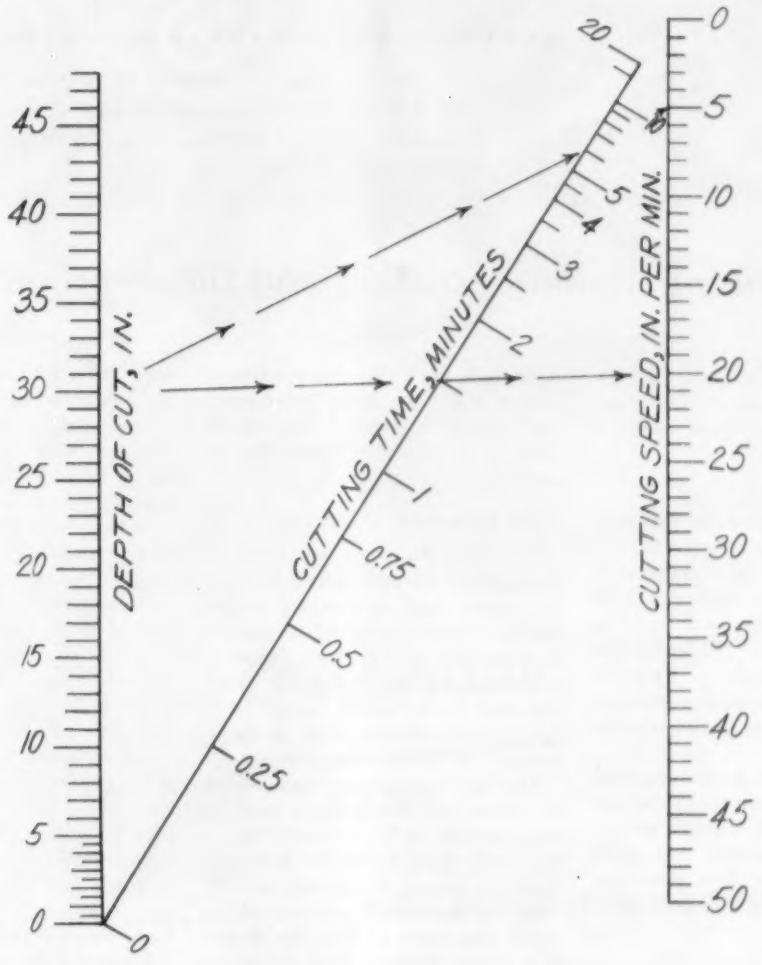


Estimating oxygen cutting time

BY LOUIS J. MURPHY

IN DESIGN and shop estimates of cutting time for metals of various thicknesses, the cutting speed usually varies with each thickness being considered. As a result, estimating the cutting time is likely to become tedious—even annoying.

The accompanying chart will help eliminate these troubles. It covers a wide range of metal thicknesses and cutting speeds.

Example: How long will it take to cut a piece of mild steel 30 in. thick when the cutting speed is 5 in. per minute? When it is 20 ipm?

Solution: Enter the chart on the left at the depth of cut—30 in.—and draw a straight line through 5 ipm on the right. Where your line intersects with the central sloping scale, read the cutting time, which here is 6 minutes. In the same way, you find that the cutting time for the 20-ipm cutting speed is 1.5 minutes.

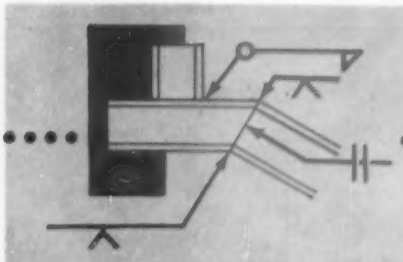
This chart is especially useful where a fractional cutting speed, such as 3.5 ipm, is being used, and where a large number of time calculations must be made.

The chart is based on: T = D/S where:

T = cutting time in minutes.

D = depth of cut, in inches.

S = cutting speed, in inches per minute.



the welding clinic

Here you may find the solution to your welding problems, whether they concern design, production, construction or maintenance welding. Submit your questions for answering on this page.

Flame-cleaning, flame-descaling and flame-priming

QUESTION:

What is the purpose of flame-cleaning before painting? How should it be done?

ANSWER:

Surface preparation is the most important part of steel painting.

Weather tests have shown that comparatively cheap iron-oxide paints, on well prepared surfaces, will stand up longer than expensive red lead paints applied to poor surfaces. Probably the best means of preparing steel surfaces for painting is by flame-priming.

Flame-cleaning, flame-descaling and flame-priming are terms that are frequently confused. Though similar oxyacetylene equipment and techniques are used for these processes, the terms must not be considered synonymous.

The Processes

Flame-cleaning is a process for cleaning steel surfaces with the oxyacetylene flame. It differs from flame-priming only in that the surface so cleaned is not to be painted or at least not until it has cooled to atmospheric temperature.

Flame-descaling is a process used extensively in steel mills and rolling mills for the removal of scale and oxide from billets, slabs, blooms and ingots.

When the surface is heated rapidly, a differential in expansion causes the scale to crack and fly off the base metal in small particles, leaving a neutral or clean surface. At the same time defects such as seams, fissures and overlaps are exposed.

To avoid confusion, flame-cleaning and flame-descaling should not be used to describe operations where painting is to be a part of the accomplished task. The term "flame-priming" should be reserved to cover the preparation of a metallic surface for painting.

The Equipment

Basically, there are two kinds of flame-priming heads—round and flat. The round head is provided with a double circular group of orifices to produce clear, neutral cone flames. It is used for such applications as cleaning rivet heads (which always carry heavy scale), fittings, faying surfaces, corners, projections and recesses.

The flat flame-priming head, which is a broad multiflame tip, is used for large smooth surfaced areas. This tip has many small brush-like flames in linear formation. It is protected from wear by hardfaced pads or skids, which also serve to hold the flames at a proper distance from the work.

Either of these heads may be attached directly to a standard welding torch handle or an extension arm.

Using the Equipment

The round flame-priming head is used in a vertical or near-vertical position. Usually, it is held about 2 in. from the work and is swung sideways to clean a strip about 12 in. wide while being moved progressively forward.

If the scale is hard to remove, it may be loosened by holding the tip closer to the work or against it at an angle of about 45 deg. When using the latter technique, it is well to have the head hardfaced for longer life.

Flat flame-priming heads are available in various widths, usually from 6 to 12 in. A 6-in. head is the most popular size. One of the more common heads of this size has 49 flame ports spaced about $\frac{1}{8}$ in. apart.

Though the orifice is rather small (approximately No. 20 drill size) it produces high velocity flames about $\frac{1}{4}$ in. long. A head of this size uses about 13 cu ft each of oxygen and acetylene for each 100 sq ft of surface treated.

When using a flat tip, hold it so that the flames will hit upon the surface at an angle of 45 deg. The torch is advanced at varying rates of speed depending upon plate thickness, the amount of scale, surface moisture and other conditions.

As indicated previously, the scale is loosened by thermal expansion and falls off in small flakes and minute particles. This flaking process is helped by the conversion of absorbed moisture into steam which builds up an explosive pressure, tending to blow the scale away.

Further loose scale is removed by vigorous manual brushing or by the use of power-driven rotary brush applied immediately behind the torch. Scale that remains after brushing may be considered "part of the metal" and need not be removed by further treatment, providing all moisture has been removed.

Surfaces thus prepared for painting will prove superior in corrosion resistance and provide an extremely tight bond. The heat not only drives off contaminants, such as moisture and corrosive gases, but it increases the mobility of the paint, causing it to flow in continuous and intimate contact with irregular surface.

Essentially, the action produces a low-temperature baking of the paint to provide a more corrosion-resistant film because it sets quickly from the base metal up toward the surface and is therefore homogeneous.

CADDY Type B-400 Amp. ELECTRODE HOLDER in use on CATERPILLAR production line—Peoria Plant.

CATERPILLAR

Today in its 51st year, the track-type tractor can look back over an outstanding record of accomplishment and development. Rugged crawlers of 1955, like this Caterpillar D8 Tractor working on a highway construction job in Missouri, are bigger, better and busier than ever.

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Caterpillar Tractor Co., internationally famous manufacturer of road building machinery for over 50 years, constantly strives for more efficient, lower cost production methods in all of their manufacturing operations.

Since 1951, arc welding circuits have been closely studied at Caterpillar under the direction of Mr. Donald L. Caldwell, Welding Supervisor, in an effort to increase efficiency and lower maintenance costs. His studies have resulted in a more efficient operation and a substantial monthly saving for Caterpillar Tractor Co. This saving can be largely attributed to the use of CADDY ARC WELDING ACCESSORIES and CADWELD solid-copper cable splices.

Overall circuit maintenance has been materially reduced, electrical efficiency increased, and according to Mr. Caldwell, operators find CADDY holders lighter-weight and cooler-operating than former holders used.

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new products . . . . . USE CARD ON PAGE 93

SELF-sufficient welder is mounted on truck for quick and easy moving

AUTOMATIC welding fixture has adjustable base and three-directional travel

Mobile welder

SELF-sufficient unit is this jeep-powered mobile welder. Unit consists of 200 or 300-amp generator with built-in exciter-generator mounted on a four-wheel drive jeep or truck. Exciter-generator supplies 1 or 3 kw at 115 volt for lights or shop tools while welding. Truck engine provides welder and generator power by a belted power takeoff system.

Unit also has tank brackets and storage boxes for tools. Front mounted winch may be installed. Unit is suitable for maintenance or construction. *A. J. Parsons.*

Circle No. 1.

* * *

X-ray unit

NEW device is designed for X-ray fluorescent analysis of large-slug specimens of steel and other metals. It is to be used with wide-range goniometers. Unit handles specimens from 3/8 to 1¼-in. depths and 4 to 10-in. square, in cross-section.

Unit can be used with current spectrographic installations.

Unit is cast of phosphor bronze with smooth finish and semigloss gray finish. Base is 24 in. long, 15 in. wide and 13¾ in. high. *North American Philips Co., Inc.*

Circle No. 2.

* * *

Electrode

"SUREWELD" iron-powder electrode is designed for high-speed welding of lap, fillet and flat-beveled joints. Welds with this electrode are said to have high impact values, good crack resistance and deep penetration.

Two types are available, "24" (AWS class E-6024) for horizontal fillets, lap and flat-beveled joints; "27" (E-6027) for operations now using E-6020 electrodes. Both types work on a-c or d-c. *National Cylinder Gas Co.*

Circle No. 3.

* * *

Lining compound

CORROSION-resistant neoprene liquid lining compound is said to combine corrosion inertness of neoprene with excellent strength and adhesion. "NeoLine" provides a live, resilient vulcanized coating for a variety of surfaces where heavy duty coating is required. It can be heat- or air-cured.

Advantages of the compound are said to be easy application, a wide range of resistance to corrosives up to 200 F, and long storage life. *Pennsylvania Salt Mfg. Co.*

Circle No. 4.

* * *

Iron alloy

GROUP of "Rezistan" cast-iron alloys are said to have high tensile strengths, impact strengths and hardness. Alloys are also corrosion resistant, particularly against atmospheric conditions, dilute acids and other chemical corrodents, according to manufacturer. *Uniworld Research Corp. of America.*

Circle No. 5.

Automatic fixture

VERSATILE automatic welding fixture has simultaneous three-directional travel, and 360-deg beam rotation. Adjustable base is said to reduce set-up time. Any standard head for automatic welding, flame-cutting or hardening can be used.

Adjusting wheel at one end of base is for precise alignment. Unit operates by pushbutton controls. Lifting eye at top of column allows easy moving. It also aids in raising fixture onto blocks for large weldments.

Welder can travel 18 ft and can be furnished with various length booms and columns. Transverse travel of boom and clearance is 8 to 12 ft, depending on unit size. *Lewis Welding & Engineering Corp.*

Circle No. 6.

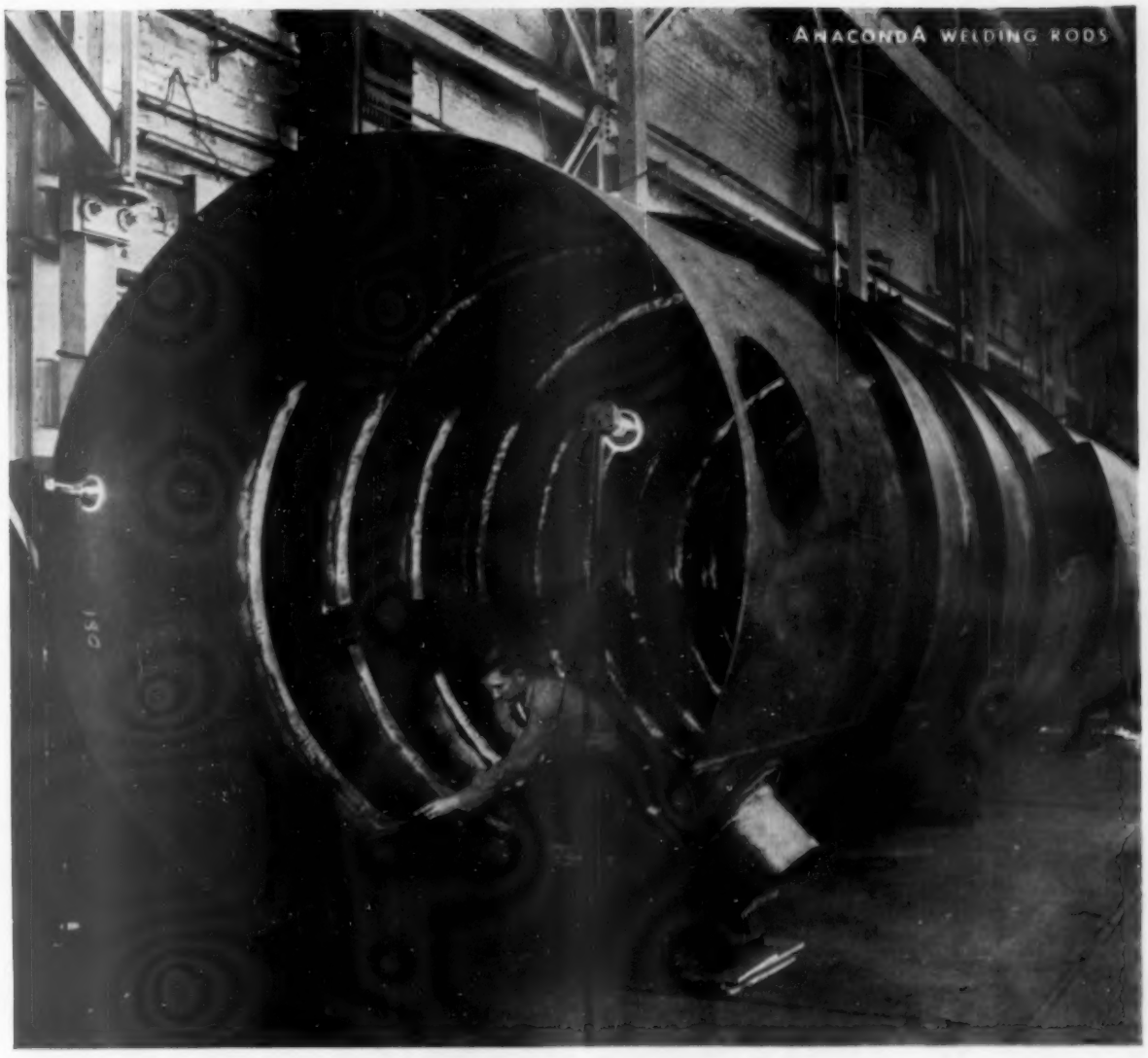
* * *

Electrode

MULTI-purpose electrode is said to produce strong, ductile joints between a wide range of dissimilar alloys. Tests indicate "Inco-Rod A" will be useful in joining austenitic and ferritic steels to each other and to high-nickel alloys. Welds are said to be crack-free, with good strength and corrosion-resistance.

Electrode comes in 14-in. lengths in diameters of 3/16, 5/32, and 1/8 in.; the 3/32-in. diameter has center grip. An all-position electrode, it operates on d-c, reverse polarity. In general, no preheat, postheat or peening are necessary. *The International Nickel Co., Inc.*

Circle No. 7.



Here's a fast, dependable method of WELDING COPPER VESSELS

NEW automatic welding methods have made great improvements in welding speeds and weld-metal quality, and the progressive fabricators of copper vessels have quickly realized the value of these advantages. Take, for instance, this large fractionating tower designed and fabricated for the chemical industry by the Vulcan Manufacturing Division of The Vulcan Copper & Supply Company, Cincinnati.

This tower is 30 feet in length and 10 feet in diameter, with many rings welded on the inside to support trays. Metal thicknesses range from ¼" to ½".

The sigma welding method, with a helium-argon mixture of shielding gas, did most of the work, using filler wire of ANACONDA Copper-372.** Welding was done manually with the backhand technique, weaving back and forth along the weld to insure soundness. The Heliarc® welding method was also used for a few minor applications. X-ray examinations were a routine matter and showed consistent soundness for the finished welds.

For practical advice on welding problems in your shop write for a copy of Publication B-13 on "Anaconda Welding Rods." Address: *The American Brass Company, General Offices, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario.* 60157

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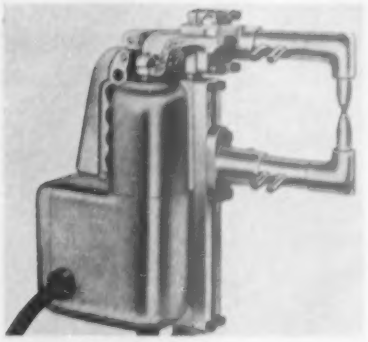

Electric welder

PORTABLE electric welder, "Hi-Amp Model 5403," is said to have high rate of production on light-gage metals. A precision-type timer gives welding accuracy from 1/10 to a full second, preventing burn-through.

Throat depth of 6 in. can be expanded to 18 in. by extension arms. Transformer and welding arms are water-cooled. Current output is 3 amp for secondary, open circuit voltage, and 20,000 amp for short circuit. Welder weighs 55 lb and is portable. A floor stand is available for foot operation. Welder can be had in three models. *The Sittler Corp.*

Circle No. 8.

* * *

Resistance welder

MECHANICALLY-operated, high-speed, resistance-welding machine is said to produce wire mesh up to 13 ft wide from coiled steel wire in continuous operation. Compactly designed machine and accessories is about 7 ft high, and occupies about 35 by 32 ft floor space.

Machine fabricates mesh from 4 to 14-gage wire at rate of 60 cross wires per minute. It can also handle up to 70 longitudinal wires, with spacing from 2 in. up; cross wires can be spaced from 2 to 12 in. Wire mesh is made in square or rectangular patterns.

High-speed operation is result of feeding six cross wires at a time, cutting them off and feeding them one by one to a resistance-welding crosshead on which 79 spring-loaded welding guns are mounted. *Expert Welding Machine Div.*

Circle No. 9.

Grinding wheel

BLUE Flash "BF" raised hub disc-wheel, a portable grinding wheel, is said to deliver substantial increases in cutting speed. It is aimed at the fastest cutting rate possible.

It is designed to penetrate deeper and take bigger bites of metal. The manufacturer also states it has a sharpness that results in faster metal removal with less work pressure. This sharpness also exists on the underside of the wheel to permit easy grinding and blending of external corner welds and convex surfaces.

The wheel is available in 7 and 9 in. diameters, and thicknesses of ⅛ in., 3/16 in. and ¼ in. *Bay State Abrasive Products Co.*

Circle No. 10.

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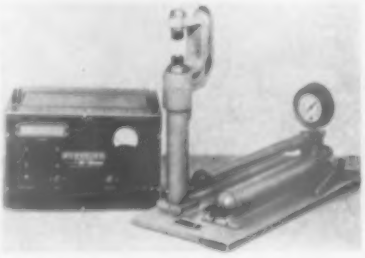

Resistance indicator

PORTABLE surface "resistance indicator" is used to test effectiveness of cleaning processes of metal. Designed for use with resistance-welding applications, it is said to provide accurate means of measuring resistance between metals.

The indicator is composed of a microhmmeter and a sample holder. The microhmmeter has ranges of 0 to 200 microhms and 0 to 2,000 microhms. Sample holder provides simulated electrode force up to 4,300 lb. *Sunshine Scientific Instrument.*

Circle No. 11.

* * *

Grinding wheel

THREE lines of grinding wheels are for general industrial use. "Tru-Matic" wheels are identified by color—green for heavy cuts, red for harder steels, blue for extra fine cutting. Suitable for most bench or pedestal type of grinding, and for both rough and finish grinding. Wheels are available in wide variety of types and angles, and for extension wheels. Diameters run from 1 to 14 in. *Tru-Matic Products Co.*

Circle No. 12.

For more information use card on page 93

Notcher

"LITTLE Blacksmith No. 43" notcher is of all-steel construction, said to be unbreakable. Its capacity is 7½ by 7½ in. with a 90-deg notch. Model can be used on 14-gage mild steel and 16-gage stainless steel. It weighs 270 lb with bench space of 21 by 16 in. Notcher has positive gages for production duplicating. *J. F. Kidder Mfg. Co., Inc.*

Circle No. 13.

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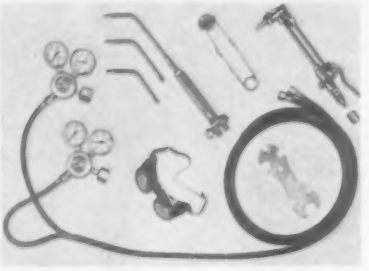

Welding kit

DESIGNED for welding, cutting, heating and brazing, the "No. 600" outfit is said to weld up to 3/16-in. and cut to ½-in. thicknesses. Outfit has standard catalog parts including oxygen and acetylene regulators, welding torch, cutting attachment, lighter, outfit wrench, goggles and welding hose. Extra cutting or welding tips are available. *Dockson Corp.*

Circle No. 14.

* * *

Solder cleaner

HOLLOW mill designed to shave soft materials, such as solder, from terminal posts or wires, is claimed small enough to be used on closely spaced transducer pins or miniature tubes, or multiple-post banana plugs.

Mill may be hand-operated or inserted in machine chuck for production work. Available in sizes from 1/32 to ¼-inch diameter. *Woodruff & Stokes Co., Inc.*

Circle No. 15.

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with the NEW VICKERS® Controlarc MAGNETIC AMPLIFIER-RECTIFIER DC Welder

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- No arc "pop outs"
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CONTROLARC automatic control is made possible by the patented Vickers Self-Saturating Magnetic Amplifier with exclusive voltage-sensing, feed-back control circuits. Constantly analyzing welding voltage and automatically adjusting welding current to arc changes. Vickers Magnetic Amplifier maintains ideal arc characteristics, through the entire welding range, under all welding conditions.

Voltage and Current Individually Controlled...

Separate, complete control of both voltage and current makes it possible to set up any volt-ampere combination within the output range of the particular Controlarc model being used . . . from minimum voltage at minimum current to maximum voltage at maximum current. Only Vickers Controlarc offers complete remote control of voltage and current through the entire welding range.

Full Range Voltage Control...

. . . separate from current control, permits choosing the exact arc characteristic for every job and welding condition. Voltage control is full range and stepless, with no limited "average" settings or blind spots. The weldor can select the arc characteristic for a basic welding position and pinpoint the setting for particular conditions.

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PROCESS diffuses chromium into ferrous metals and forms a stainless surface alloy to depths from 0.001 in. to 0.008 in. and doesn't cause dimensional changes.

This process is said to permit ferrous metals to resist corrosion even under the most severe atmospheric, water and chemical, conditions. It also resists thermal oxidation even at temperatures to 1,700 F and wear and abrasion under a variety of difficult applications.

Products can be welded before or after processing. They can be arc welded, spot welded and brazed. *Alloy Surfaces Co.*

Circle No. 16.

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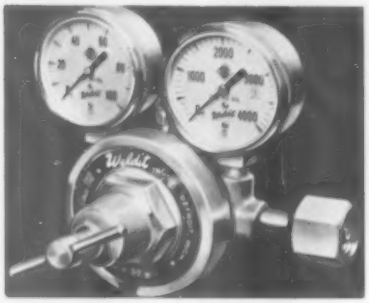

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Regulator

"DUO-TROL" is the new "Series 50", dual-control regulator for oxygen and fuel gas control. Regulator is precision built to take rough handling. Compact in size, with forged body and bonnet, it is adaptable for both light and heavy-duty work, manufacturer states.

Regulator has full view gages; a new filter gives good seat protection. The "Duo-Trol" safety automatically resets itself. There is steady flow at all working pressures; adaptable for use with a flowmeter. *Weldit, Inc.*

Circle No. 17.

* * *

Weldor's goggles

Two new types of goggles are available for welding and chipping. Both are the eyecup-type with a chain bridge, and ventilating feature said to eliminate fogging and harmful ray entrance.

Type "GW" is for cutting, burning and brazing. Lenses are 50 mm, shades 1.5 to 14. Type "GC" is for chipping, grinding and machining. Lenses are 50 mm, clear, safety-hardened or laminated. Frames are of non-burning plastic. Nose bridges and headbands are adjustable. *Glendale Optical Co., Inc.*

Circle No. 18.

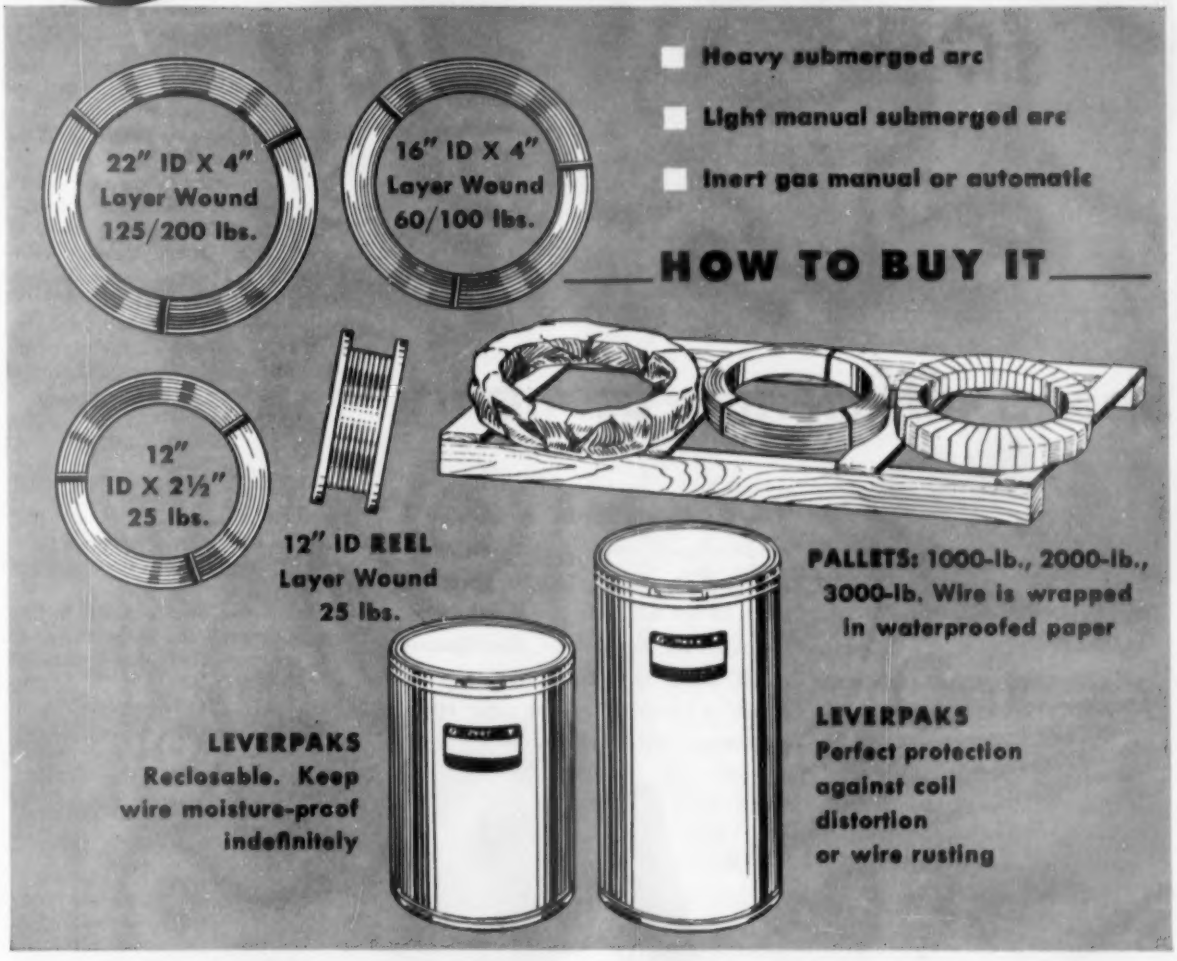
an ACCO product

Page Welding Wire

PAGE CHECK-OFF

Check the welding wire you use:

- ☐ Heavy submerged arc
- ☐ Light manual submerged arc
- ☐ Inert gas manual or automatic



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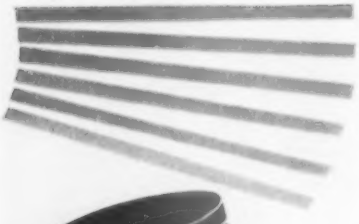

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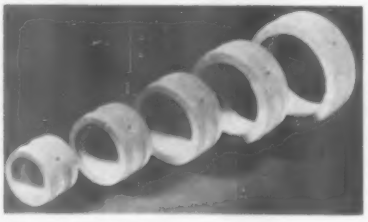
Name _____

Address _____ City _____ State _____



Backing ring

"PYROTONE" ceramic backing rings are said to withstand high arc temperatures and insure proper root fusion. Rings are adaptable for field or shop pipe welding.

Rings are easily removed when weld is complete by flushing out shattered ring. Insulating properties of the rings are claimed to stop weld-metal chilling, permit lower welding amperage and thus allow rapid welding. Uniform light beads form inside pipe, stopping excessive penetration and icicles. *General Ceramics Corp.*

Circle No. 19.

* * *

Clamp

"AIRMATIK" clamp is air actuated and is claimed to reduce change time, operator fatigue and dropping of fixtures.

Clamp works on 75 to 100-lb line pressure through any outlet valve. At 100-lb pressure, clamp has hold-point pressure of 600 lb.

Each clamp has pneumatic cup to force plunger pin against spring-loaded rocker arm. Holding end of arm has adjustable screw for different heights. *Kajon Mfg. Co.*

Circle No. 20.

* * *

Cutting torch

OXYGEN cutting torch is designed to hold down the gas consumption as low as possible. At the same time, it is reported to maintain the cutting speed and reduce the initial period of preheating that is necessary to begin the cut.

The manufacturer guarantees it to save at least 40% of fuel gas and 12% of oxygen. By changing the nozzle, any type of fuel gas can be used.

The torch incorporates an automatic economizer which comes into operation right after preheat and with the opening of the cutting oxygen stream. *Buckle Flame Cutter Co. Ltd.*

Circle No. 21.

For more information use card on page 93

Welded pipe joint being radiographed with isotope camera using iridium 192.

It's piping with problems—

so every joint is welded—and

RADIOGRAPHED

THIS UNIT of a piping system is headed for duty never faced by piping before. High pressure? Yes. High temperature? Yes.

Critical work like this calls for welding—with radiography proving every weld sound.

Welding has a staunch friend in radiography.

In high-pressure piping, in the manufacture of pressure vessels, and in structural applications, radiography continues to open up new opportunities for welding.

Radiography can help you build business, and earn a reputation for highly satisfactory work.

If you would like to know more about what it can do for you, talk to your x-ray dealer.

EASTMAN KODAK COMPANY
X-ray Division
Rochester 4, N. Y.

Radiography...

another important example of Photography at Work

Kodak

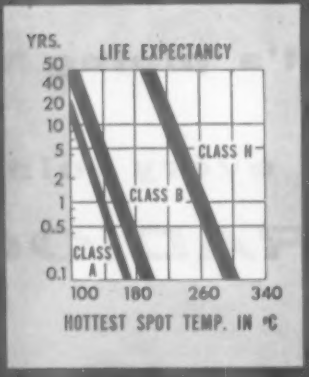
NEW G-E AC

offer a group of tested performance features

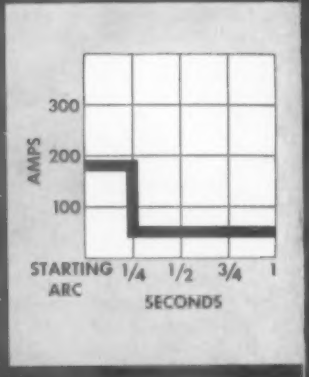
COMPARE THE VALUE

Prove the superiority of General Electric a-c welders to yourself. Just check this feature-by-feature comparison of G-E welders with four other popular makes. You'll see that only G-E provides you with *all* these features . . . for top performance over a long lifetime of service.

MOVING COIL DESIGN: inherent stepless adjustment permits pinpoint accuracy in current settings.



SILICONE INSULATION (Class H) withstands temperature extremes which disintegrate ordinary insulation.



AUTOMATIC HOT START gives instant arc striking throughout current range.

GENERAL ELECTRIC	✓	✓	✓
MANUFACTURER "A"			✓
MANUFACTURER "B"	✓		
MANUFACTURER "C"			✓
MANUFACTURER "D"			

ASK ABOUT FREE TRIAL OFFER—Contact your local G-E Welding Distributor for full information. He is listed in the yellow pages of your phone book. Write for Bulletin GEA-6243 to Sect. 711-2, General Electric Co., Schenectady, N. Y.

WELDERS

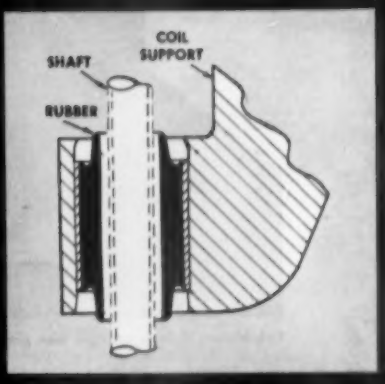
unmatched by any other welder

Four husky ratings—295, 300, 400, and 500 amps; feature high open-circuit voltage.

ARC STABILIZERS assure steady arc, faster welding, fewer "patch ups."

LARGE CURRENT SCALE can be read easily from the job; expanded in low range for extra-fine accuracy.

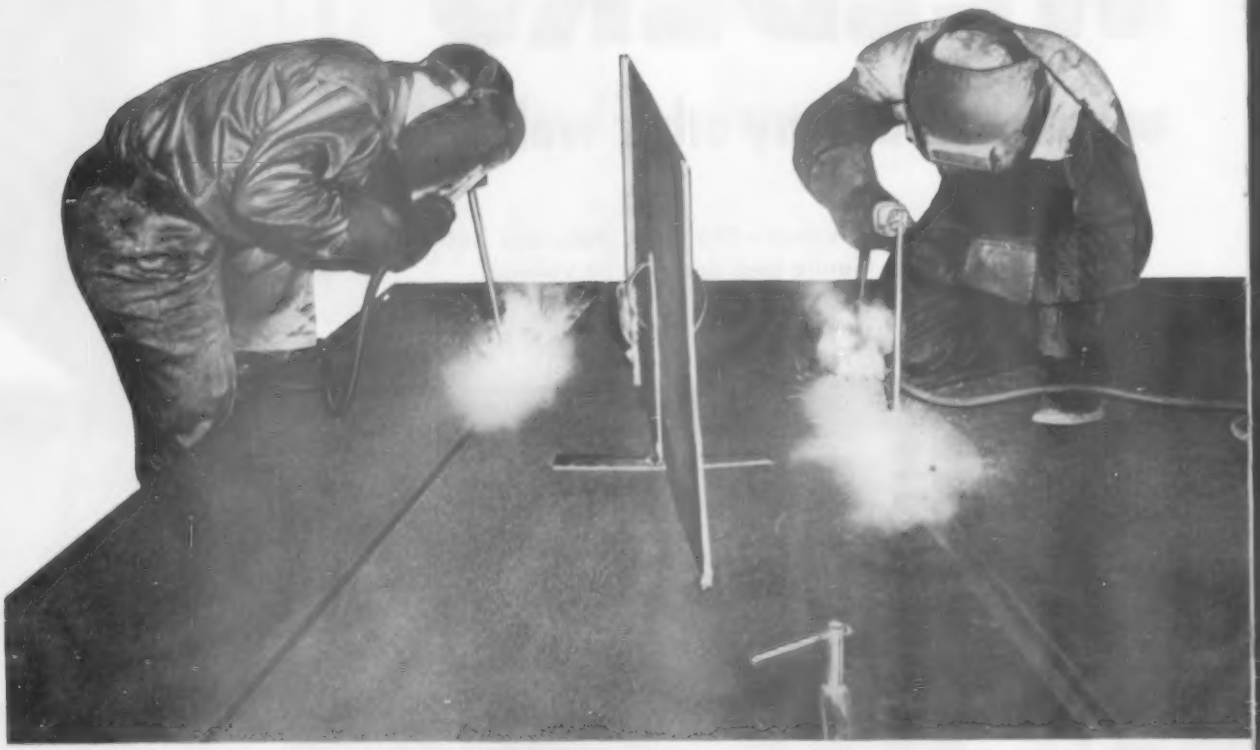
EASILY REMOVABLE SIDE COVERS: only three screws have to be removed for quick access to inside.



FLOATING-COIL MOUNT gates current adjustment, minimizes friction, noise, wear and vibration.

GENERAL ELECTRIC

AT THE FRONTIERS OF PROGRESS YOU'LL FIND.....



Fabricating ½-inch wrought iron pier plates with "Easyarc 12" electrodes. Powdered metal electrode coating actually becomes part of the weld deposit.

Easyarc 12 can cut welding costs in half

Airco's "Easyarc 12" contact electrode cuts welding time and costs two ways. (1) The electrode deposits more metal per kilowatt of arc energy than *any other welding process*. This is because the powdered metal coating actually becomes a part of the weld. (2) The "Easyarc 12" electrode can carry a higher current than conventional electrodes, without danger of breakdown. Users have reported cutting their production costs in half by using time-saving "Easyarc 12" electrodes. And you get all these other advantages:

Restrike – No need to trim electrode to restrike. A light touch will restore the arc.

Slag removal – Many users have found the fast cooling of Easyarc welds causes slag to curl up of its own accord. A slight rap knocks it off.

Appearance – "Easyarc 12" leaves a clean, smooth bead contributing to the over-all appearance of the finished product.

To help you select the *right* electrode for your welding job – whatever it may be – write for Airco Electrode Pocket Guide. It's free! Address your nearest Airco office. Ask for Catalog #1318. All Airco Electrodes are available through your Authorized Airco Dealer.

AIRCO®

AIR REDUCTION

60 East 42nd Street • New York 17, N. Y.

Divisions of Air Reduction Company, Incorporated, with offices and dealers in most principal cities
Air Reduction Sales Company
Air Reduction Pacific Company
Represented internationally by Airco Company International
Foreign Subsidiaries:
Air Reduction Canada Limited
Cuban Air Products Corporation

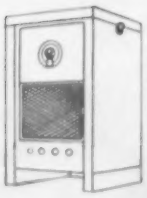
Products of the divisions of Air Reduction Company, Incorporated, include: AIRCO – industrial gases, welding and cutting equipment, and acetylenic chemicals • PURECO – carbon dioxide, liquid-solid ("DRY-ICE") • OHIO – medical gases and hospital equipment • NATIONAL CARBIDE – pipeline acetylene and calcium carbide • COLTON – polyvinyl acetates, alcohols, and other synthetic resins.

AN AIR REDUCTION PRODUCT

AIRCO items for arc welding

NEW EASYARC LH 7-16— electrode deposits 6.58 pounds of metal per hour – 61.3% more metal than conventional, contact-type, low-hydrogen electrodes of the same diameter. Extra-thick powdered iron coating helps control arc action, melts to become part of the weld, and allows a higher current to be used without danger of breakdown. Welds have outstanding stretch and toughness characteristics. No underbead cracking. Restriking properties are excellent.

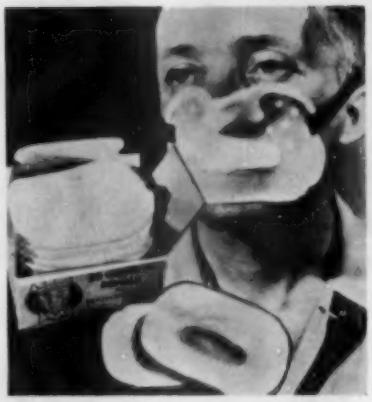
AIRCO HOLDERS— Famous Jackson jaw-type and Martin Wells screw-type holders. Nineteen Jackson Models from 200 to 500 amperes. Six Martin Wells, including the Heavy Duty Model 6S—the only holder on the market that will handle 700 amperes.



NEW AIRCO DC "BUMBLEBEE"— rectifier type arc welders in 200, 300, 400 and 600 ampere models. The newest member of a famous arc welding family. Also available in twin model. Outstanding features include:

- No moving parts except fan.
- 3-step current selector switch with rheostat.
- Handy remote control outlet.
- Twin channel cooling system.
- Concealed electrode and work terminals.

Write for literature on these items.



Dust mask

PROTECTIVE lightweight mask weighs less than ½ oz. Mask is made of pliable soft-rolled aluminum. Designed for protection against ordinary non-toxic dusts and spray, it can be worn with goggles. No metal touches the skin. Known as "GS No. 48A", mask has long-staple cotton filter, easily replaceable. Refills are available in lots of 100. *General Scientific Equipment Co.*

Circle No. 22.

* * *

Burner

"MELTERAMA T-3" tar kettle burner has high and low-heat control. Replaceable burner orifice gives added efficiency, it is claimed. Used with high-pressure regulator, "T-3" gives constant heat for melting jobs. Burner is built of steel and brass with a cast iron base. *Weldit, Inc.*

Circle No. 23.

* * *

Grinding wheel

GRINDING wheel, for gray iron foundries, is said to be longer-lasting due to a vitrified bond holding the abrasive materials. Bond helps keep sharp corner on wheel's grinding face. This is important in grinding excess metal from gray-iron castings. *Electro Refractories Corp.*

Circle No. 24.

Correction

Some gremlins must have got into our type last month. On page 82 of the June issue of WELDING ENGINEER, a new product, "Spat-R-Pruf" welding compound, was listed as "for promotion of adhesion of welding compound." As everyone—but that gremlin—knows, it is for "prevention" of spatter adhesion.

Our abject apologies to the York Engineering Co., Chicago, manufacturers of the compound, for this inadvertent error.

THE MOST ADVANCED AUTOMATIC FLUXING SYSTEM EVER OFFERED FOR BRAZING

EASY WAY TO LOW COST

- All-State "Jet Flux" Auto-Dispenser No. 1 as you get it from the factory . . . is a pressure cylinder complete with automatic dispenser, controls, and hose with connections . . . ready to tie in, without special tools, to single or multiple brazing stations.
- Only one supply item — All-State "Jet Flux"—fluxes brazing work automatically through the fuel gas.

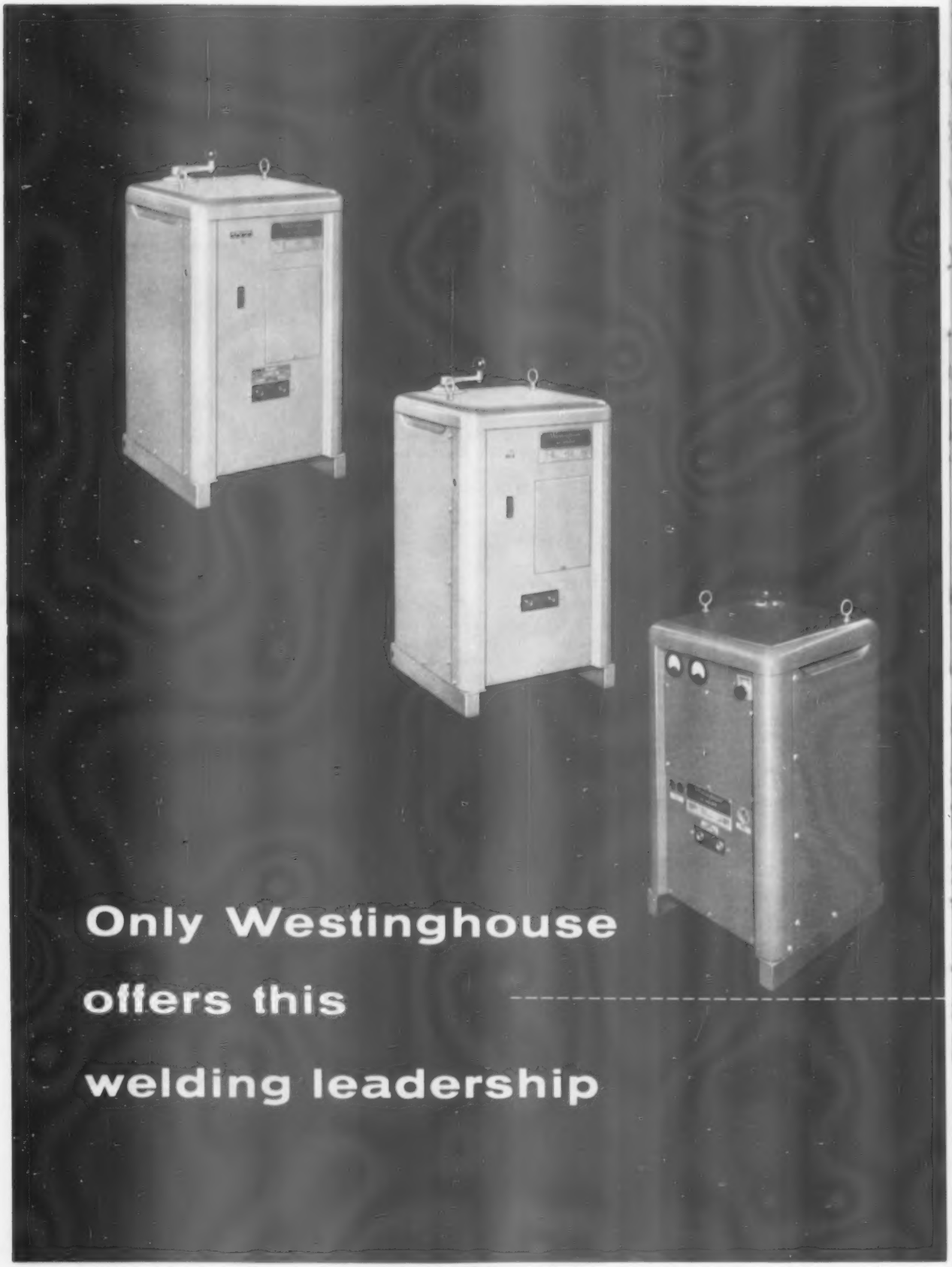
Ask to see "Jet Flux" Demonstrated by your Distributor

A-S DISTRIBUTORS EVERYWHERE

All-State

ALL-STATE

WELDING ALLOYS CO., INC.
White Plains, N. Y.


Only Westinghouse
offers this
welding leadership

Copied by all . . . but never equaled

Through the years, Westinghouse has been the leader in engineering advancements of arc welding machines. Pioneer of a-c welding, Westinghouse was also the first to produce a rectifier d-c welder. Today, these advancements have become standards of the industry . . . copied by all.

This pioneering leadership continues, as Westinghouse leads the field with advanced design machines possessing features that give you improved performance at lower cost. Here are the pace-setting advancements of Westinghouse:

RA, d-c welder

Designed exclusively for industrial d-c welding with full three-phase rectification for stable arc characteristics. Exclusive Arc Drive Control gives an extra surge of power when needed. Inherently high power factor (85%).

TA, a-c welder

Designed exclusively for industrial a-c welding with full 80-volt open circuit. Hot-Start Control gives instantaneous arc starting under any conditions. Single-range stepless current control for minimum current change-over time. Lower initial cost than a d-c machine or combination machine of comparable rating.

AND NOW—THE RCP

A rectifier, constant-potential machine for automatic and semi-automatic welding. Offers exceptionally high efficiency and power factor with low maintenance costs, which are inherent in Westinghouse rectifier-type machines. This means a real operating savings for you.

J-21908

YOU CAN BE **SURE**...IF IT'S Westinghouse

WESTINGHOUSE ELECTRIC CORPORATION
Welding Dept., P. O. Box 868, Pittsburgh 30, Pa.

Please send full information on:

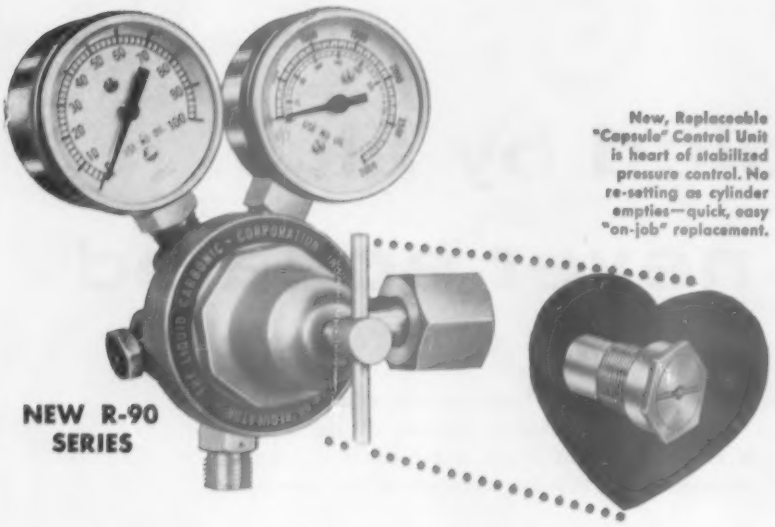
- ☐ RA, d-c welder
- ☐ TA, a-c welder
- ☐ RCP, constant-potential welder
- ☐ Have welding specialist call

Name _____ Title _____

Company _____

Street and No. _____

City _____ Zone _____ State _____


NEW R-90
SERIES
New, Replaceable "Capsule" Control Unit is heart of stabilized pressure control. No re-setting as cylinder empties—quick, easy "on-job" replacement.

Single-Stage Cost 2-Stage Efficiency

NEW Gasweld

BALANCED-PRESSURE REGULATORS

- **Set It and Forget It!** Maintains stable delivery pressure as gas is consumed. Eliminates constant regulator re-adjustment.
- **Amazing Low Cost** due to new simplified design. Approximately 40% less than 2-stage, 20% less than most single-stage regulators.
- **New, "Capsule" Control Unit** permits easy, on-cylinder repair. Fewer repair parts to stock.
- **Safety Plus**—seats protected by non-flammable nylon filter. 2¼" nickel silver diaphragm. Forged body and bonnet. Easy to read gauges.

Ideal for practically every welding and cutting job. Made and guaranteed by LIQUID CARBONIC—famous for the highest quality. Write for additional details and prices.

LIQUID also produces Oxygen, Acetylene and other commercial gases including CO_2 in all its forms—Gas, Liquid and Solid (dry ice) for industrial use.

Liquid THE LIQUID CARBONIC CORPORATION
Industrial Gas Division
3100 S. Kedzie Ave., Chicago 23, Ill.

West of the Rockies: STUART OXYGEN CO., Los Angeles In Canada: IMPERIAL OXYGEN LTD., Montreal

Spot welder

SPOT welder is designed for continuous production welding. Machine handles up to two pieces of 13-gage steel, manufacturer states. Welder has adjustable lower arm, and it can be foot or air-operated.

Two models are available, "140T" with timer and "140" without timer. Machine is rated at 50% duty for continuous production; it operates at 220 volts, 60 cycles, single phase. Available in throat depth of 12, 18 or 24 in.; arm diameter of 1¼ or 1½ in.; electrode diameter of ¾ in.; 10 in. maximum space between arms. *Birdsell Mfg. Co., Inc.*

Circle No. 25.

* * *

Electrode

NEW "Easyarc LH 7-16" electrode deposits 60% more metal than conventional low-hydrogen electrodes, claims manufacturer.

Factors behind this welding speed are concentrated arc energy, powder-iron coating which melts and becomes part of weld, and extra-heavy coating which helps to control arc action, allowing use of higher currents with safety. *Air Reduction Sales Co.*

Circle No. 26.

* * *

Polishing kit

DESIGNED for deburring, smoothing and polishing, "Polishing Kit" has assortment of polishing wheels, cones, blocks and mandrels. Each kit has instructions for application of rubberized abrasives. *Cratex Mfg. Co.*

Circle No. 27.

For more information use card on page 93

How NI-ROD "55" welded the lift back into this lift truck

saves $195 on the price of a new iron casting

This fork lift truck, used in a Connecticut warehouse, was completely out of commission.

Two important cast iron lugs that support the steel tilt shaft had broken. (The tip of the pencil points to the inside of one lug; the light area to the left of the pencil tip is the upper side of the lug.)

A new casting with those support lugs on it would cost $260 . . . and plenty in labor to install! Should they buy it? Or scrap the truck?

The warehouse manager had another idea: *welding*. He called in Tommy's Welding Service of Glenbrook.

Tommy Behan said if the repair could be made, he could do it . . . with NI-ROD "55" electrodes.

First, he ground a full vee in each cast iron lug and filled them in with Ni-Rod "55". Next, he welded a ¼-inch steel band to each. Then, he welded a third band to the casting between the lugs for added support. Finally, he welded steel pipe couplings to the center support lug as a bearing for the shaft.

The whole job was done with 5/32-inch diameter NI-ROD "55" electrodes. And it cost the warehouse only $65!

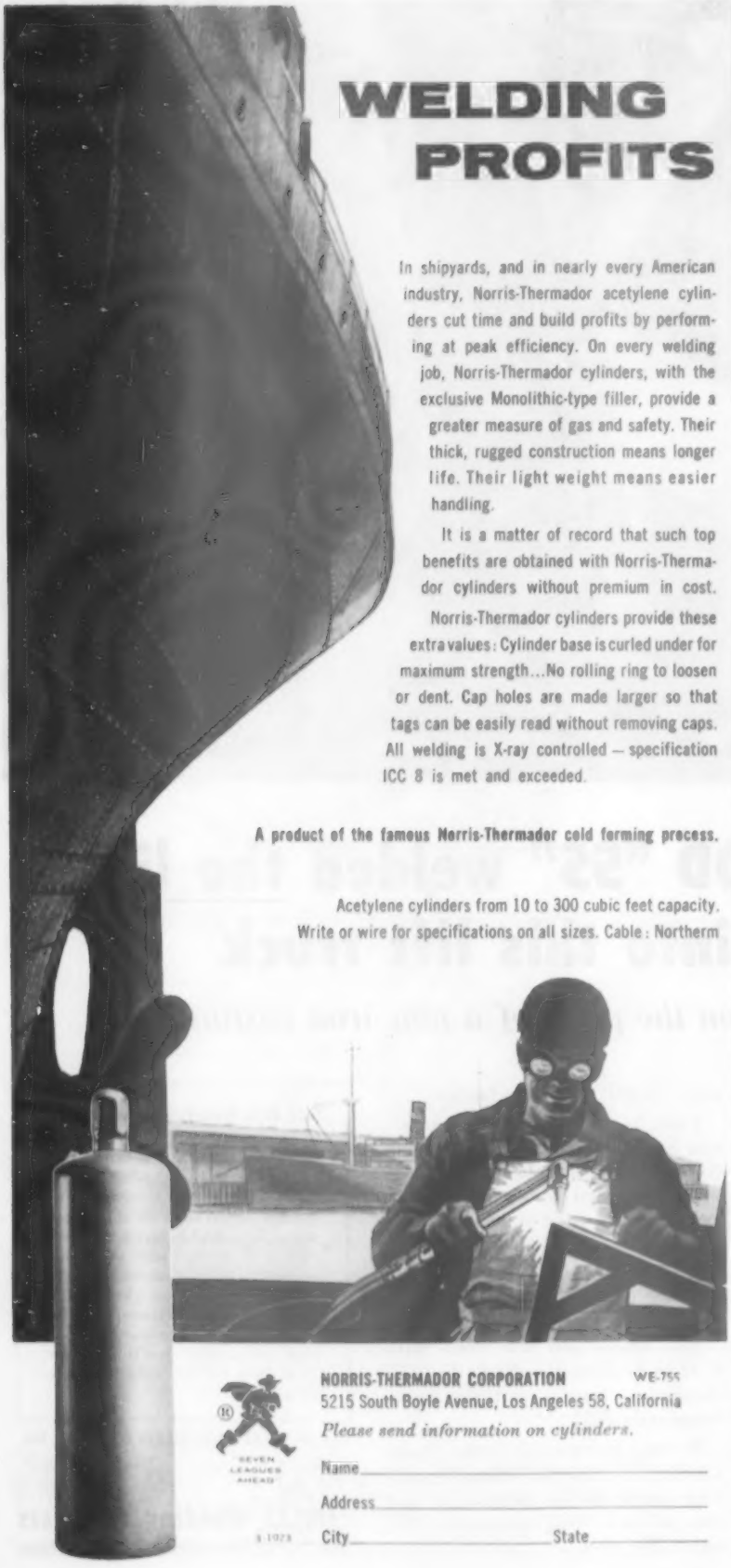
Welding was possible because easy-handling NI-ROD "55" electrodes produce sound ductile deposits in cast iron, and in welding cast iron to other metals like steel.

Get this helpful new booklet

If you want more information on successful cast iron welding, send for the latest Inco booklet on NI-ROD "55"® and NI-ROD®. It gives you the actual facts on the success others have had in welding *a wide variety of castings with these companion nickel and nickel-iron electrodes.* Also tells you which of the two is generally preferred in different jobs . . . how to use them . . . what advantages you'll discover. Write Inco for this valuable booklet today.

The INTERNATIONAL NICKEL COMPANY, Inc.
67 Wall Street New York 5, N. Y.

INCO Welding Products
TRADE MARK Electrodes • Wires • Fluxes



WELDING PROFITS

In shipyards, and in nearly every American industry, Norris-Thermador acetylene cylinders cut time and build profits by performing at peak efficiency. On every welding job, Norris-Thermador cylinders, with the exclusive Monolithic-type filler, provide a greater measure of gas and safety. Their thick, rugged construction means longer life. Their light weight means easier handling.

It is a matter of record that such top benefits are obtained with Norris-Thermador cylinders without premium in cost.

Norris-Thermador cylinders provide these extra values: Cylinder base is curled under for maximum strength...No rolling ring to loosen or dent. Cap holes are made larger so that tags can be easily read without removing caps. All welding is X-ray controlled — specification ICC 8 is met and exceeded.

A product of the famous Norris-Thermador cold forming process.

Acetylene cylinders from 10 to 300 cubic feet capacity. Write or wire for specifications on all sizes. Cable: Northerm

NORRIS-THERMADOR CORPORATION WE-755
5215 South Boyle Avenue, Los Angeles 58, California
Please send information on cylinders.

Name_____

Address_____

City_____ State_____

Hardening compound

"ARMOR-TUF" steel hardening compound is used in treating of steel parts and tools. Liquid compound is painted on parts eliminating soaking. This process is said to require only a few minutes near the critical steel temperature to obtain high hardness. Depths of 3/1000 to 10/1000 need only a short time; greater depths of 15/1000 to 20/1000 are reached in 30-45 minutes. Parts may be dipped or sprayed. *Armor-Tuf Sales Corp.*

Circle No. 28.

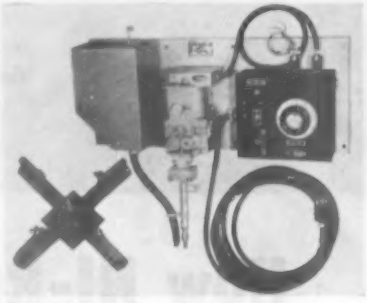
* * *

Transformer

"TYPE LS" is a series of oil-immersed, self-cooled, distribution and power transformers. Newly designed tanks have added durability due to welded form, with inner and outer ribs. Such construction is said to eliminate oil leaks. *Marcus Transformer Co.*

Circle No. 29.

* * *



Welding head

AUTOMATIC welding head is designed for use with constant-voltage "Powromatic" welder. Unit has simplified controls, wire feed and current pick-up assembly, flux hopper and wire reel. Parts can be easily arranged for any desired job set-up.

Unit uses wire sizes 0.035 to ¼ in. and has one set of wire feed rolls of size customer specifies. Other sizes are available. Flux hopper has 25-lb capacity; adjustable wire reel can handle coils 12 to 16 in. I.D., 2½ to 4 in. wide. *Hobart Bros. Co.*

Circle No. 30.

* * *

Galvanizing

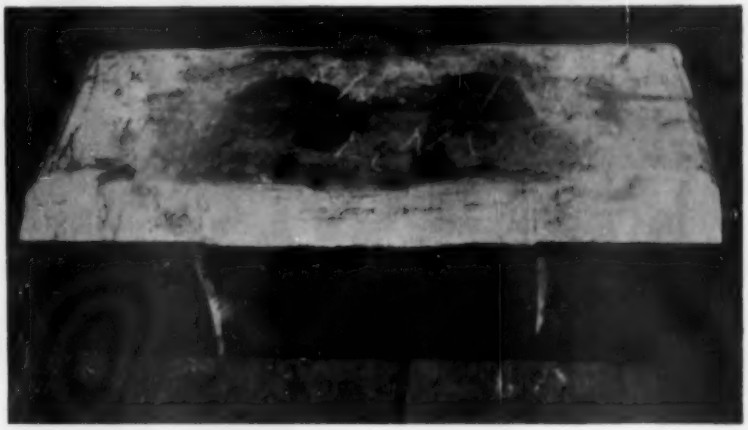
"GALVICON" is a coating designed for protection of iron and steel from corrosion. A cold galvanizer, it is applied by brush or spray. Coating combines with base metal and galvanizes it, manufacturer states.

"Galvicon" is quick drying, non-injurious. Can be applied without dismantling. Available in 4 can sizes, ½ pt, qt, gal or 2-gal. *Galvicon Corp.*

Circle No. 31.

Extending die life with Crucible REXWELD. At points of greatest wear, the die face is undercut to a depth of ¼" below finish dimensions. It is then preheated to about 600F and hardfaced with REXWELD VT, using approximately twenty pounds of electrodes. The die is then cooled in air, and its surfaces ground to size. It is then ready for the press.

This REXWELDED die is shown after 11½ turns of continuous operation. During this period 155,000 pounds of steel were forged, 80% of which were *Superalloys S-816 and A-286*. At this point the press foreman reported a slight depression in the die face. *It had already given 400% greater service than had been experienced from untreated dies.*



Crucible REXWELD hardfacing rods keep dies in service 4 times longer...

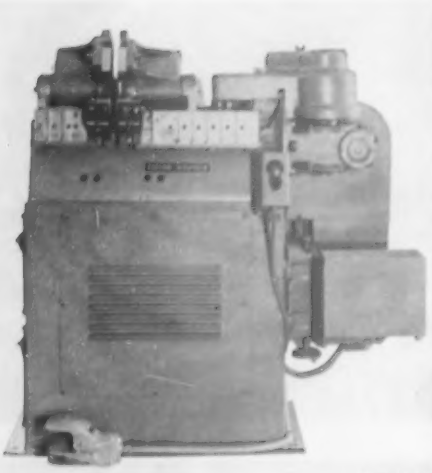
This tungsten-bearing austenitic stainless steel die is designed for forging high-speed and high-alloy steels on a 1000-ton press. Normally, after only 1 to 3 eight-hour turns of production, it must be removed from the press and its surfaces replaned. And successive planing operations quickly reduce the die's thickness to below minimum limits, and it must be scrapped.

But by REXWELDING as shown above, die life is extended 400% or more. For REXWELD adds a surface that is even tougher, more wear-resisting than the original die material – and you can REXWELD again and again.

So when you have an application where surfaces must withstand wear or abrasion, try REXWELD. Your nearby Crucible warehouse has REXWELD low-hydrogen coated electrodes and bare rods in the sizes and grades you need. *Crucible Steel Company of America, Henry W. Oliver Building, Pittsburgh 22, Pa.*

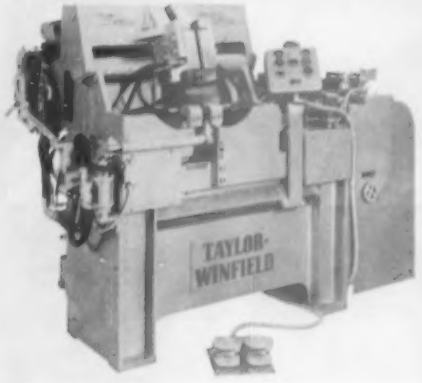
CRUCIBLE first name in special purpose steels

Crucible Steel Company of America



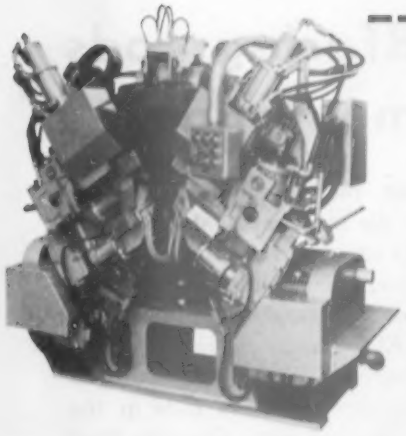
A Standard T-W Resistance Welder

Versatile uses; prompt delivery; lowest price.



Or A Standard Welder Modified

Special tooling; special time cycle; increased production; low-cost re-tooling.



Or A Special Welder Designed for Your Work

Volume production at lowest unit cost.

Resistance Welders Since 1898

TAYLOR-WINFIELD

RESISTANCE WELDERS

SPOT • PROJECTION • SEAM • FLASH-BUTT

THE TAYLOR-WINFIELD CORPORATION

Sales and Service

CHARLOTTE • CHATTANOOGA
CHICAGO • CLEVELAND
DALLAS • DAYTON • DENVER
DETROIT • LOS ANGELES
PHILADELPHIA • PORTLAND, ORGEON • SEATTLE • ST. LOUIS
STAMFORD • WASHINGTON
OAKVILLE AND WINDSOR, ONTARIO

WARREN, OHIO

NEW PRODUCT BRIEFS

Gas mask kit is designed to meet any plant hazards for millwrights and maintenance men. *Acme Protection Equipment Co.*
Circle No. 32.

* * *

Pressurized dry chemical fire exinguisher, 10 lb, is approved for a pressure range of from 150 to 250 lb. *Walther Kiddie & Co., Inc.*
Circle No. 33.

* * *

Refractory, thin silicon carbide slab will permit efficient firing of ceramic materials up to 3,000 F without warping or cracking. *Electro Refractories & Abrasives Corp.*
Circle No. 34.

* * *

"Watchdog", scanning instrument, can oversee 6, 12, 24, 48 or more different steps at once in a manufacturing process. *Fielden Instrument Div. of Robertshaw-Fulton Controls Co.*
Circle No. 35.

* * *

"Skullgard" plastic safety helmet is designed to offer extra protection to the vital zones that are most often exposed to impact. *Mine Safety Appliance Co.*
Circle No. 36.

* * *

"Magnistors" are said to have all the advantages of transistors and magnetic cores without having the attendant disadvantages. *Potter Instrument Co., Inc.*
Circle No. 37.

* * *

Portable electric metal-cutting band saw weighs 16 lb and is said to be 15 times faster than a hand hack saw. It can be used free-hand in any position. *Porter-Cable Machine Co.*
Circle No. 38.

* * *

"Tiny-Titan" No. 130 is a fine, precision tool designed to eliminate make-shift clamping. This magnetic base dial indicator instantly mounts to flat or down to round surfaces as small as ¾ in. in diameter with pull of 65 lb. *Enco Mfg. Co.*
Circle No. 39.

* * *

Improved two-pole mercury relay has new collar for tube support. Other features are simple bakelite terminal blocks and durable "alumina" mercury-holding cups. *Ebert Electronics Corp.*
Circle No. 40.

HENRY

PRATT

COMPANY

welds 3½% Nickel Steel in half the time with

ATOM•ARC

8016N
IRON POWDER LOW HYDROGEN ELECTRODES

For nearly thirty years, the Henry Pratt Company of Chicago has specialized in the designing and building of many types of butterfly valves. The fabricated body shell illustrated above is an example of an unusual butterfly valve made for an unusual service. Installed in a closed-circuit controlled-atmosphere wind tunnel, this Stressed Seal* Butterfly Valve must withstand transonic velocity air streams at temperatures ranging from —100°F. to +650°F.

*Copyright Henry Pratt Co.

FIELD REPORT

CUSTOMER: Henry Pratt Company, Chicago, Illinois.

FABRICATION: 66" and 48" Butterfly Valve bodies of 3½% Nickel Steel to be used in a closed-circuit controlled-atmosphere wind tunnel.

ELECTRODE: ATOM • ARC 8016N—Iron Powder, Low Hydrogen Electrode.

Using ATOM • ARC, no pre-heat required. ATOM • ARC 8016N eliminated costly and troublesome pre-heat procedures on this job making available more man-hours for production welding to get the job done faster for less money.

Using ATOM • ARC, greater weldor ease and comfort. ATOM • ARC 8016N allowed easier *all-position* welding and reduced slag cleaning time to a minimum. Annoying pre-heating and gas fumes were no longer a problem on the job.

Using ATOM • ARC, weld metal deposit was increased 30% with no appreciable spatter loss.

Using ATOM • ARC, no porosity or cracking of any kind in the welds.

SUMMARY: ATOM • ARC reduced welding time and increased weldor efficiency for an impressive overall cost reduction of approximately 50%. And, greater weldor ease and comfort on the job was an important extra. Here are valuable advantages you'll want in your operations—that's why it will pay you to switch to ATOM • ARC right now!

Alloy Rods Co.

Write today for the complete story on Alloy Rods Company's latest development—ATOM • ARC... *the only all position iron powder, low hydrogen electrode.*

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Pacific Coast Sales Offices and Plant
750 Lairport Street
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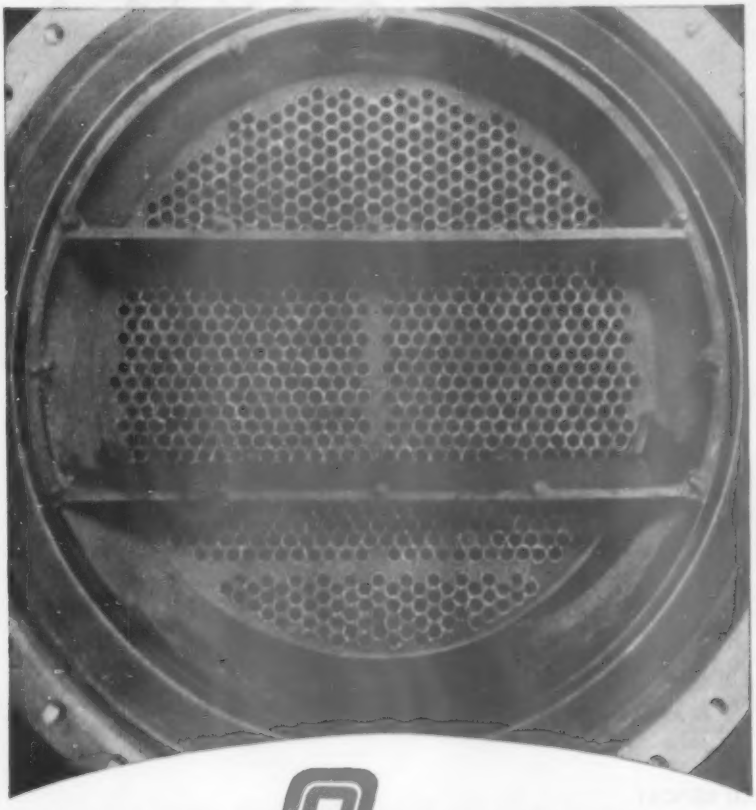
Save time, money and worry when welding stainless steels



WELD WITH ARCOS

STAINLESS ELECTRODES

Arcos controls in manufacture guarantee highest quality weld metal easily deposited. Widest electrode selection in the industry enables you to meet accurately the physical, chemical and metallurgical requirements of every job. Special ELECTRO-PAK prevents moisture pickup and chipped coatings in shipment and storage, also provides resealable feature. ARCOS CORPORATION, 1500 South 50th Street, Philadelphia 43, Pa.

NEWS . . . . . *from page 6*

Ohio State University. The award was made at the recent, second annual engineering conference held in Columbus.

Mr. Davis was cited for his attainments as an industrial executive and civic leader. He was among the first recipients of the new award, established to honor outstanding engineering graduates.

• • •

ASM joins atomic industrial group

The American Society for Metals, Cleveland, Ohio, has become a member of the Atomic Industrial Forum, Inc., New York City. The Forum is a non-profit organization of industry and education. Its aim is to develop atomic energy for peaceful purposes.

• • •

Rankin moves into new California plant

Rankin Mfg. Co. has moved into its new plant at 616 Marengo Ave., Alhambra, Calif. The new building will provide larger and more efficient office and plant facilities for the hard facing-alloy manufacturer.

• • •

Welding research conducted at Babcock & Wilcox center

Research is a continuing process at the Babcock & Wilcox Co. center at Alliance, Ohio. One project is the development of welding equipment for a new automatic submerged-arc process. This process is said to deposit metal five times faster than present methods.

New welding metals for use in the atomic field are also being investigated. A metallurgical section is gathering data on mechanical properties of metals at low and high temperatures, and on metallic strength, ductility, toughness, shock and impact-resistance.

• • •

Worthington to handle Mullenbach controls

Worthington Corp., Plainfield, N. J., has been appointed sole national distributor for the line of welding controls manufactured by Mullenbach Div. of Electric Machinery Mfg. Co., Minneapolis, Minn., a Worthington subsidiary.

Effective June 1, all Mullenbach controls became known as "Worthington-Mullenbach controls." All future inquiries are to be directed to the Worthington Corp.

Precision Welder has new Cincinnati location

Precision Welder & Flexopress Corp., Cincinnati, has moved into its new general offices and manufacturing plant at 3520 Ibsen Ave.

The firm was previously located at 138 E. McMicken Ave.

* * *

Welding firm builds new plant in New Jersey

Stainless Welded Products, Inc., Jersey City, N. J., plans to move into its new plant at Clifton, N. J., in September of this year.

The new building will contain 38,000 sq ft of working space and will have two new mechanical presses. The plant will be at One Clifton Blvd., two miles east of the new Garden State Parkway.

* * *

American Brake Shoe buys Denison Engineering

The American Brake Shoe Co., New York City, has acquired Denison Engineering Co., Columbus, Ohio, manufacturer of hydraulic equipment and automatic controls.

No changes are contemplated in management or plant operations. W. C. Denison, founder and president of the 24-year-old company, will continue as president.

* * *

Wilton Tool moves into new plant

Wilton Mfg. Co., Inc. has moved into its new general office and factory building at 9525 Irving Park Rd., Schiller Park, Ill. Located on a five-acre tract, the structure has 68,000 sq ft of floor space all on one floor.

Built in modern industrial style, the plant incorporates advanced machine-tool production facilities and methods.

* * *

Iron and Steel Institute medal to Arthur P. Woods

Arthur P. Woods, Jr., was recently awarded the American Iron and Steel Institute medal for his paper, "Some Statistical Methods Used in Studies of Steel Plant Operations." Mr. Woods, a research engineer of Armco Steel Corp., Middletown, Ohio, received the award at the Institute's 63rd general meeting in New York City.

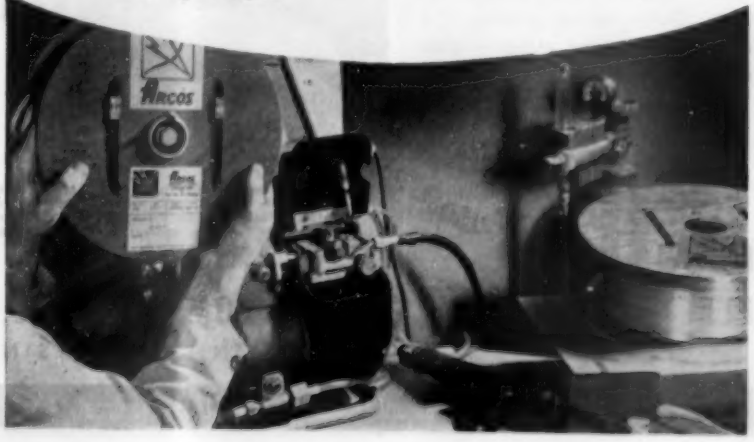
This award is voted by the board of directors for a paper of special merit and importance.

How to improve quality on every aluminum job welded by inert gas

WELD WITH ARCOS

ALUMINUM SPOOLED WIRE

The advantages of aluminum weld-fabrication are many. But only a quality weld metal can produce them with maximum benefit. Arcos manufacturing controls applied to ALUMAR Spooled Wire are a sure guarantee. Within a critically controlled range you can meet every characteristic with "peace of mind". ARCOS CORPORATION, 1500 South 50th Street, Philadelphia 43, Pa.



Baldwin-Lima gets contract for Table Rock Dam

Baldwin - Lima - Hamilton Corp., Philadelphia, Pa., has been awarded a contract to furnish penstock and spillway gates and gate hoists for the Table Rock Dam.

The penstock and spillway gates are to be of all-welded steel construction. Construction is scheduled for this year with delivery in 1956. The dam is to start operation in 1958.

Table Rock, a combination flood control-power generation project of the U. S. Army Corps of Engineers, is located on the White River, 8 miles southwest of Branson, Mo.

* * *

Ultrasonics laboratory established by Aeroprojects

Aeroprojects, Inc., West Chester, Pa., has established a research laboratory for ultrasonic applications. The firm, manufacturer of a system for fluxless soldering and other ultrasonic equipment, is currently experimenting with solvent extraction, spraying and emulsification. Another lab is working on ultrasonic soldering.

in Shipbuilding as in other great industries
MILLER WELDERS are preferred

St. Louis Shipbuilding and Steel Co., largest builders of inland towboats in the world, require welds that will withstand a maximum amount of abuse.

Look anywhere in St. Louis Shipbuilding's mammoth yard and you will see Miller Selenium Rectifier type D.C. arc welders—in single units or in batteries of four and five for greater output.

For dependable welds, St. Louis Shipbuilding prefers the Miller S.R. welder. Miller is glad to be aboard.

Miller Selenium Rectifier type D.C. Arc Welders are available in four wide range models. For complete information on these and other Miller arc and spot welders, contact us today at no obligation, of course.

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ELECTRIC MANUFACTURING COMPANY, INC.
APPLETON, WISCONSIN

Distributed in Canada by Canadian Liquid Air Co., Ltd., Montreal, P.Q.

Taylor-Winfield is host to Ohio State students

Twelve upper class students of the welding engineering department of Ohio State University recently visited the Taylor-Winfield Corp., Warren, Ohio. Their purpose was to learn more about plant production and layout as well as resistance-welding techniques.

* * *

Study flash welding of molybdenum

The investigation of flash welding of molybdenum at Rensselaer Polytechnic Institute, Troy, N. Y., is under the sponsorship of Carbide and Carbon Chemicals Co., New York City (a division of Union Carbide and Carbon Corp.)

Research, under leadership of Dr. Ernest F. Nippes, will include study of high temperature alloys, effect of thermal cycles on ductility, and processing of such alloys.

* * *

Kaiser installs casting facilities at Mead, Wash.

Ingot casting facilities are being installed at the Kaiser Aluminum & Chemical Corp.'s Mead, Wash., plant. The facilities, using the direct chill method, will produce rolling ingots in several of the most commonly used alloys.

The unit will also supplement part of the firm's Trentwood plant operations. Construction is scheduled for completion late this year.

* * *

Norton to open new West Coast plant

A new plant for the manufacture of grinding wheels is scheduled to be opened Jan. 1, 1956, at Santa Clara, Calif., by Norton Co., Worcester, Mass.

The new one-story plant is to be located at 2555 Lafayette St. The building contains 50,000 sq ft of factory and office space. It is on an 8 1/3 acre plot. George A. Garrison has been named plant manager.

* * *

Welding experts meet in Frankfurt, Germany

The annual meeting of Welding Experts, scheduled for June 13-16, in Frankfurt, Germany, included lectures on the latest welding procedures and new fields of welding applications. Of especial interest were the discussions on flame-cutting and fusion welding.

Automation conference in Los Angeles, Sept. 12-16

Tenth Instrument-Automation Conference and exhibit of the Instrument Society of America will be held in Los Angeles on Sept. 12-16. The conference is to be at the Shrine Exposition Hall.

Due to continuing demands for space, an annex is being erected adjacent the Shrine Hall.

* * *

Two films available on resistance welding

Two films, "The Resistance Welding of Stainless Steel" and "This is Resistance Welding" are available, upon request, to plants and schools from the Resistance Welder Manufacturers' Association, Philadelphia, Pa.

* * *

Specification of tungsten arc-welding electrodes

The first specification covering tungsten arc-welding electrodes, has been issued by AWS and ASTM. Completion of this data makes possible standardization of non-consumable electrodes used for Tig (tungsten inert-gas) and atomic hydrogen welding.

The data classifies electrodes into four basic chemical analyses, allowing selection by composition. Also established are standard sizes, lengths and tolerances. This two-page sheet (AWS A5.12-55T) is available at 40 cents per copy from the American Welding Society, 33 West 39th St., New York 18, N. Y.

* * *

Zender elected head of Copper & Brass Ass'n.

Austin R. Zender was recently elected president of the Copper & Brass Research Association at a meeting held at Hot Springs, Va. Mr. Zender is executive vice-president of Bridgeport Brass Co., Bridgeport, Conn.

* * *

Caterpillar forms Australian firm

Caterpillar of Australia Pty. Ltd. was recently formed by Caterpillar Tractor Co., Peoria, Ill. The new subsidiary is the third established since 1950.

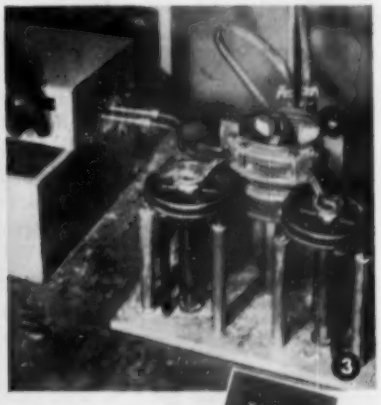
The firm, to be located near Melbourne on a 100-acre tract, will manufacture and sell Caterpillar's regular products. The firm will also sell replacement parts. Purchase from Australian firms is also planned.

EASY-FLO *and* SIL-FOS
will cut Your Metal Joining Costs

Photos and data courtesy of Zatko Metal Products Co. Euclid, Ohio

It's easy to cut costs on a wide variety of metal joining jobs with these low-temperature silver brazing alloys. *Simply use a fast heating method and a setup that promotes fast handling of parts.* In that way you get full benefit of the remarkably fast brazing of strong, virtually indestructible joints inherent in the exclusive composition and properties of EASY-FLO and SIL-FOS. Take this job for example — brazing one-piece stamped pulleys to shafts:

1. One girl slips pulleys onto shafts and applies HANDY FLUX. The other puts a ring of EASY-FLO 45 wire on top of each assembly.
2. Assemblies with preplaced alloy rings, are put in fixtures which accurately position pulleys, and are brazed automatically by induction heating.
3. Heating time for 2 assemblies is 25 seconds. Production per 8-hour shift is 1500. Assemblies are tested to 4000-lb. pull.



THE FULL STORY WILL CONVINCE YOU
It's all in words and pictures in BULLETIN 20 — including useful pointers on joint design and time-labor-cost-saving brazing production methods. Write today for a copy.

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There's no "...or equal" for EASY-FLO and SIL-FOS

Lukens Steel Co. plans expansion

Lukens Steel Co., Coatesville, Pa., has announced it is planning to expand into the fields of plastics, contractors' equipment, highway supplies, pleasure boats and do-it-yourself. John A. Crowe was appointed manager for commercial development.

* * *

Atomic trade fair in Washington Sept. 26-30

The first trade fair of the atomic industry is scheduled for Sept. 26-30 at the Sheraton-Park Hotel, Washington, D. C. The fair, to be held in conjunction with the fall meeting of the Atomic Industrial Forum, will stress selling the products of atomic energy.

* * *

Movie shows scenes of atomic energy processes

Scenes from Atomic Energy Commission plants in Idaho and Pittsburgh, now unclassified, have been included in a new 30-minute film, entitled "A Dawn's Early Light." A section is devoted to the numerous uses of atomic energy in manufacturing, farming, etc.

Shown for the first time, publicly, are construction scenes of the nuclear power plant for the first atomic submarine, the U. S. S. Nautilus.

The film is available on loan, without charge, from Westinghouse film division, Westinghouse Electric Corp., Box 2278, Pittsburgh 30, Pa. It may also be purchased outright.

* * *

Helicopter service for two Chicago shows

Helicopter service is planned between the Production Engineering Show and the Machine Tool Show to be held in Chicago, Sept. 6-16.

The engineering show will be at Navy Pier and the machine tool at the International Amphitheatre. This service is said to be the first of its kind for exposition visitors.

* * *

ASTM publishes 1954 volume of proceedings

The 1954 edition of *ASTM Proceedings* has just been published. The 1,400-page volume records the technical accomplishments of the American Society for Testing Materials, including technical reports and papers offered to the Society.

Copies may be purchased from the Society, 1916 Race St., Philadelphia 3, Pa. The price is $12 per copy.

* * *

21 nations represented at radioisotope "school"

Thirty-two scientists and technicians from 21 nations attended a special four-week course in radioisotope techniques during May at Oak Ridge, Tenn.

This project was one of several launched for the furtherance of the atoms-for-peace program. The purpose was to permit qualified research workers and technicians to gain sufficient facility in the use of radioisotopes, or "tracer atoms" and to apply this technique in their own work.

* * *

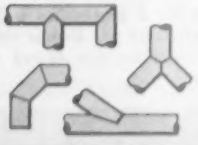
Plant maintenance show scheduled for July

Technical sessions will be featured at the second annual Western Plant Maintenance and Engineering Show in Los Angeles from July 12 to 14. The Ambassador Hotel and Pan Pacific Auditorium will house the various sessions and events.

Some of the topics to be covered are case histories on preventive maintenance, cost control and corrosion.

LAY OUT ANY PIPE JOINT

LAY OUT ANY PIPE JOINT, SHOWN BELOW, on any size pipe from 1½" to 48"



Mark Structurals
Adapter for marking structural angles included with either model of the Contour Marker.

The proven, fast easy way

IN LESS THAN 5 MINUTES you can lay out a Y, a T, an L or any angle joint with a Contour Marker. IT'S EASY and absolutely accurate; it is calibrated in both degrees and pitch. Just set the angle and with a smooth swing of the Contour Marker's soapstone point you are ready to cut! You save "man hours" as well as oxygen and acetylene gas because "cut and try" methods are eliminated.

Two Sizes: Standard, for pipes 1½" to 18" dia.; Jumbo, for pipes 16" to 48". Instruction book included. Belt case available. Write for information.

Sold by welding supply dealers everywhere.

CONTOUR MARKER CORP. OF CALIFORNIA
1843 East Compton Boulevard, Compton, California

BOYCE CENTERING HEAD marks center line at any degree of angle on pipe, shaft, tube. Leveling gauge on dial.

24" RADIUS MARKER is folding compass of Dural aluminum. Folds to 9¼" pocket size; weighs 8 oz.

PIPE FLANGE ALIGNER expands and centers inside pipe to align flange for welding. For any pipe dia. 3" to 12"

THE *Original* CONTOUR MARKER
ACCURACY PROVED BY TEN YEARS OF SERVICE TO WELDERS

Westinghouse scientists make "perfect" iron

Slivers of pure iron, having breaking strengths close to 1,000,000 psi, have been produced by the research laboratories of Westinghouse Electric Corp., Pittsburgh, Pa.

The slivers or "whiskers", each a pure-iron crystal, are said to be so perfect that no defects can be detected. The crystals are about 2 in. long and 0.001 in. thick. Previous attempts to produce pure iron resulted in crystals observable only through a microscope.

Discovery of the pure iron will make possible realistic study of the pure metal.

* * *

Industry to invest heavily in atomic research

Approximately $300,000,000 will be spent by industry on atomic energy research in the next four years, according to an Atomic Industrial Forum report. The Forum, located in New York City, made the report under an agreement with the Atomic Energy Commission.

* * *

API meeting in Chicago held May 16-18

The American Petroleum Institute held a Products Pipe Line Conference in Chicago at the Edgewater Beach Hotel on May 16-18.

* * *

Welded sculpture wins $1,500 prize

Steel sculpture of two insects, a graphic portrayal of the fight for survival, is currently on exhibit at the Art Institute of Chicago. Entitled "Struggle", the piece, of welded construction, won a $1,500 prize for its creator, Hawaiian-born Joseph Goto.

* * *

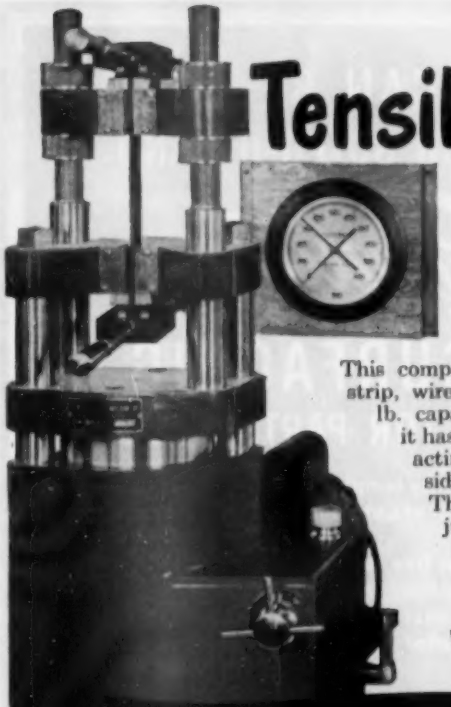
Distributor appointments

Carboloy Dept. of General Electric Co., Detroit: Austin Ford Logan Inc., Buffalo, N. Y.

Cleaver-Brooks Co., Milwaukee: Dykes Co., Shreveport, La.; Powell Equipment Co., Houston, Texas.

Edward Valves, Inc., East Chicago, Ind.: F. J. Hearty & Co., Los Angeles, Calif.

K-G Equipment Co., Inc., Allentown, Pa.: Air Products of Texas, Houston, Texas; Alabama Oxygen Co., Birmingham, Ala.; Billen Supply Co., Meriden, Conn.; Clements Welding & Machine Co., St. Louis, Mo.; D & R Welding Supply, Decatur, Ill.



Tensile Testing

Fast! Accurate! Easy!

This compact machine tests spotwelds, strip, wire, anything within its 20,000 lb. capacity. Hydraulically powered, it has an easily controlled ram, self-acting specimen grips that are open sided for easy specimen insertion. This tester, Model ST-1, is adjustable to take specimens 5" to 9" in length. Various load gauges, grips, and other modifications are available.

Write for more information – give us your requirements.

DETROIT TESTING MACHINE COMPANY

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THE ALL NEW Weldit DUO-TROL Regulator

DESIGNED TO MEET THE EXACTING REQUIREMENTS OF MODERN INDUSTRY

Rugged—forged body and bonnet with steel bushing, precision built. Dependable—steady flow at all working pressures.

Safe—safety control automatically resets itself. Full view gauges.

SUPER SENSITIVITY

The Duo-Trol gives the highest degree of accuracy for:

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- Cutting
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Equally adaptable for both Light and Heavy Duty work.

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NOW YOU CAN BE SURE
HOW MUCH BUILD-UP AND
Ranite
HARDSURFACING
YOUR TRACTOR PARTS NEED

Write for this new cut-away template (Form A-7) that you can use in measuring the wear of Caterpillar rails, sprockets, idlers, grousers, and rollers.
Also be sure you get your free copy of Form A6-1 giving exact specifications for Caterpillar, International, and A-C tractor rollers and idlers. This sheet also shows step by step how to apply RANITE to all tractor and shovel parts to insure the longest possible life.

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WELDING Har-Worth ELECTRODE HOLDER SUPPLIES
are a Guarantee of Reliable Service

The holder you have been looking for is a HAR-WORTH. Designed for the weldor's comfort and heavy welding.

HAR-WORTH manufactures a complete line of
ELECTRODE HOLDERS
GROUND CLAMPS
CABLE CONNECTORS
TERMINALS &
CIRCLE BURNERS

Write for literature and prices

WEIGHT: 17 oz. for a 300 Amp. fully insulated HAR-WORTH

HAR-WORTH "STINGER"

HAR-WORTH MANUFACTURING COMPANY
744 Broad St., Newark 2, N. J.

Arthur R. Lytle was recently appointed vice-president, research, for Electro Metallurgical Co., a division of Union Carbide & Carbon Corp., New York City. Mr. Lytle has been associated with Union Carbide since 1923; in 1946 he became head of the welding department and subsequently assistant manager of research and, in 1951, director of research for Electro Metallurgical. Mr. Lytle has been responsible for many welding innovations, including new welding rods and uses of oxyacetylene flame-cutting. He is a member of the American Welding Society, American Society for Metals, and the American Institute of Mining & Metallurgical Engineers.

* * *

Richard V. Anderson has recently been appointed district sales manager by National Electric Welding Machines Co., Bay City, Mich. Associated with Mr. Anderson as sales engineers are *Gerald S. Ellsworth* and *Elton W. Turner*. Offices are in Detroit.

Anderson

* * *

Cyrus N. Johns has succeeded *Wilmot F. Wheeler* as chief executive officer of American Chain & Cable Co., Inc., Bridgeport, Conn. Mr. Wheeler continues as chairman of the board. Other changes include retirement of *Stanley Mann* as treasurer (he will continue as a director); election of *Arthur C. Laske* as treasurer, he retains his position of secretary; election of *Wilmot F. Wheeler, Jr.*, to a vice-presidency.

* * *

Robert E. Steele has been appointed public relations manager for the New York area of General Dynamics Corp., New York City. *Samuel J. Wornom, Jr.*, has been appointed public relations manager of the firm's Electric Boat Division, Groton, Conn. *Kenneth Koyen* has been named public relations representative with headquarters in Washington, D. C.

McLeese

Stareck

Dr. J. E. Stareck is the new director of research for Metal & Thermit Corp., New York City. He will continue in his post of director of research for United Chromium, Inc., a subsidiary of the firm. *H. D. McLeese* has been named general sales manager and will direct the sales of both firms. Mr. McLeese was formerly vice-president and general sales manager of United Chromium.

* * *

The following promotions were recently announced by American Welding & Mfg. Co., Warren, Ohio: *Verne Wildman*, plant superintendent, to general superintendent; *Leo D. Dunlap* to assistant general superintendent; *John P. Lynn* to assistant manager of manufacturing.

* * *

Walter H. Girdler, Jr. was recently elected a vice-president and *Harold W. Alenduff*, treasurer, of National Cylinder Gas Co., Chicago. Mr. Girdler has been a director of the company since 1953; Mr. Alenduff, with the firm since 1936, became assistant treasurer in 1942.

* * *

R. F. Parker has been appointed manager of carbide component sales for the Carboloy Department of General Electric Co., Detroit. His duties will include development of "Hevimet", a super-dense tungsten alloy, and wear-resistant applications of carbides.

* * *

Philip J. Neville has been appointed treasurer and director of Reid Avery Co., Inc., Baltimore, Md. He succeeds the retiring *John G. Sutton*.

* * *

Minnesota Mining & Mfg. Co., St. Paul, Minn., recently assigned new duties to three vice-presidents. *Joseph C. Duke* will head the adhesives and coatings division, in addition to the coated and related products group. *Hubert J. Tierney* has been named head of the newly-formed plastics division. *Clarence B. Sampair* has taken charge of the tape and ribbon products group.

FIRST TRULY PORTABLE
200 AMP. ARC WELDER

Weighs only 65 lbs.; carry it to the job!
Using the first TOROIDAL transformer!

BREN-WELD
TRADE MARK
MODEL 200 AW

OBSOLETES ALL OTHER
WELDERS OF COMPARABLE RATING!

Employing the first toroidal transformer ever used in arc welders, the portable Bren-Weld does the work of conventional welders 4 to 5 times its size and weight. Eliminates the necessity to transport bulky equipment or heavy parts to be welded. *Now you can carry Bren-Weld to the job!*

Bren-Weld handles electrodes from 3/64" through 5/32"; it has adjustable arc voltage for various arc characteristics.

Because it is so flexible in operation and application, Bren-Weld is ideal for plant production and maintenance, for construction work, for railroads, on the farm and in home workshop.

24 HOUR DELIVERY FROM STOCK!

- 200 Amp.—At 50% Duty Cycle
- 250 Amp.—Reduced Duty Cycle
- 110/220 Volts A.C., 50/60 Cycles
- *Also Available For 220/440 Volts*
- Simple To Use—Fully Guaranteed

11" x 12" x 7½"
LIST PRICE $169.50
(F.O.B., L. I. CITY, N. Y.)
Lowest Price On Market For Comparable Ampere Rating

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AT THE FRONTIERS OF PROGRESS YOU'LL FIND

AN AIR REDUCTION PRODUCT

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HIGHEST QUALITY

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eliminates dust at its source!

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DUST CONTROL means each machine has its own custom-tailored dust collector designed to work specifically for *that* machine. There is no guess work, or average suction. Furthermore, dust control is provided only when that machine is running . . . there is no waste of power such as you have with centralized control when only a few machines are operating. This means better dust control at lesser operating cost and less initial installation cost. Get the facts now on how Torit will work better to . . .
"CLEAR THE AIR".

See our catalog in Sweet's Machine Tool File, or write:

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ST. PAUL 2, MINNESOTA

Charles Cotton has been named assistant sales manager of the West Coast plant of The Burdett Oxygen Co., Cleveland, Ohio. Prior to joining the company in 1947, Mr. Cotton had several years' experience in welding and sales.

Cotton

* * *

Ralph D. Parker has been elected vice-president and *Walter A. McCadden*, comptroller, of The International Nickel Co. of Canada, Ltd. Mr. McCadden was also elected comptroller of The International Nickel Co., Inc., New York City. He succeeds in both positions the retiring *Cameron R. Whitehorne*. Mr. Parker will continue as general manager of Canadian operations.

* * *

Harry C. Platt, formerly vice-president in charge of production, has been appointed president of the Engineered Castings Div. of American Brake Shoe Co., Rochester, N. Y. He succeeds *N. G. Belury*, recently appointed sales vice-president.

* * *

Richard L. Howland has been appointed district manager in the Chicago area for Mid-States Welder Mfg. Co., Chicago. Mr. Howland was formerly with Victor Equipment Co. in Chicago and Metal & Thermit Corp. in Grand Rapids.

* * *

L. H. Christensen has resigned as executive vice-president and secretary of the Reid Avery Co., Inc., Baltimore, Md. Mr. Christensen, with the company since 1929, will remain as consultant.

* * *

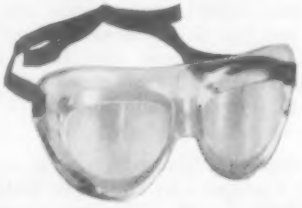
Edwin R. Reed is now resident demonstrator for the Grinding Machine Div. of Norton Co. (Worcester, Mass.) for the Los Angeles sales district. *Leonard C. Mattson* succeeds Mr. Reed as resident demonstrator in the Chicago area.

* * *

M. D. Bellware has joined The International Nickel Co., Inc., New York City, as member of the welding group of the Development and Research Division's technical service section. Mr. Bellware will devote most of his time to the iron base alloys, particularly the austenitic stainless steels. He is a member of the American Welding Society and the American Society for Metals.

sellstrom
safeguards
designed
for
comfort

WON WORLD FAME
Because of
Ventilating Feature



The Famous No. 420
Sellstrom
Welding Goggles

These are the Sellstrom World Famous Welding Goggles. They achieved world-wide popularity because the abundant ventilation reduces fogging to a vanishing point. They save time and money because the welder is not forced to stop every few minutes to wipe the fog from the lenses. Here are the facts:

1. Each eye cup has six 1/8" ventilating ducts with an extra ventilating duct on each side—a total of eight ventilating ducts for each eye cup, 16 for each pair of goggles. No other goggles can equal this abundant ventilation.
2. The air ducts are so arranged that it is impossible for a single speck of light to penetrate through the air ducts.
3. The frame is moulded from tough Thermal plastic setting with all edges carefully rounded to assure maximum face comfort. The special inner lens-retaining rings are so firmly fastened that even a cracked lens remains in place.
4. A covered stainless steel nose-bridge chain (50# strength) permits adjusting to 1/1000 inch for perfect fit. Single adjustment one-piece head band.
5. Extremely light weight, including lenses 3½ ounces. Each pair in an individual carton.

If you are not now using the popular No. 420 Welding Goggles, we urge you to try them. They will perfectly satisfy the most critical welder. They also satisfy the management because they permit increased welding per man hour.

Order from your dealer or write us direct regarding this extraordinary welding goggle.

sellstrom
MANUFACTURING COMPANY
Eye and Face Safeguards
Designed for Utmost Comfort
226 Hicks Road Palatine, Illinois

William E. Bryan has been named director of sales and *Eugene A. Cooney*, director of purchases by Rapid Electric Co., Bronx, New York. The firm, manufacturer of d-c power supplies, recently expanded into the germanium rectifier field.

* * *

John H. Morava is the new manager of sales, Chicago district office, of the U. S. Steel Corp., Pittsburgh, Pa. *Edward W. Backes* has been appointed manager of sales for the St. Louis, Mo., office.

* * *

H. K. "Bert" Little has been appointed sales representative for Rankin Mfg. Co., Alhambra, in the Middle West. Mr. Little's territory extends from Ohio to Colorado and Oklahoma to the Canadian border. He will headquarter in Kansas City.

* * *

Merritt L. Smith has been appointed executive advisor of Metal & Thermit Corp., New York City. As staff coordinator, Mr. Smith will assist the president in integrating sales activities. He had been manager of advertising and sales promotion.

* * *

Thor Power Tool Co., Aurora, Ill., has appointed *Clarence B. Bergren*, branch manager in the Milwaukee office. He was formerly manager of the Cleveland branch. *Robert J. Grace* was appointed to succeed Mr. Bergren as Cleveland manager. Mr. Grace was formerly service engineer in the Indiana territory of the Chicago branch.

* * *

Frank W. Fink was recently named vice-president and chief engineer by Ryan Aeronautical Co., San Diego. Mr. Fink was formerly chief engineer of the San Diego Division of Convair.

* * *

Dr. Bernard Kopelman has been appointed chief engineer of the Atomic Energy Div., of Sylvania Electric Products Inc. Dr. Kopelman is responsible for all technical operations, including research and development of atomic fuel elements and reactor components.

* * *

Jack Fairlie has joined the editorial staff of WELDING ENGINEER, replacing *Jerome Shaffer* as assistant editor. A graduate of Northwestern University, Mr. Fairlie was formerly public relations manager for American Hospital Supply Corp. He has served also as copyreader for the *Chicago American* and as a special assignment writer for *Golf Digest* magazine.

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Drawalloy
CORPORATION

QUALITY CONTROLLED
STAINLESS STEEL
WELDING WIRE

- available in Spools, Coils and Lengths
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Welding wire by Drawalloy is made to an exacting high standard . . . a high standard established by long-experienced welding men who know welding wire and how it must work. Set-ups for automatic and semi-automatic welding take more time than regular welding. That's why you want to be sure of satisfaction *before* you start. This *reliable* wire is weld-tested to give the best results every time. Write today for complete information and prices.

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MANGANESE-NICKEL STEEL
HOT ROLLED PLATES

WRITE for your copy of detailed specifications on Manganal Hot Rolled Plates.

- Reduce impact and abrasive wear. Work-harden, too!
- Can be flame cut, welded, formed, sheared and punched.

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SOLE PRODUCERS 92 N. J. RAILROAD AVE. NEWARK, N. J.
NEAREST DISTRIBUTOR UPON REQUEST

We all can't get into the ad

but here are four of our family of 25 FLUXINES. 50 years of scientific research enable us to give you the particular FLUXINE you need.

"Complete line of 'KOP-R-ARC' coated rods for welding copper and all copper alloys."

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No. 44 FLUXINE —for copper brazing —cutting tool metals, carboloy, vanadium alloys, etc.

No. 43 FLUXINE Non-glaring — for low-melting silver solders on stainless steel, iron, inconel, etc. No injurious fumes.

No. 45 FLUXINE — for soldering brass, copper, steel, etc. with low-melting silver solders.

Write on company letterhead for chart and generous sample stating which FLUXINE desired.

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Dept. J, 669 W. Ohio St., Chicago 10, Ill.

Boat Trailer Manufacturers!

Here's an accessory that will really help sell your boat trailers. A *solid brass* winch for little more than you'd pay for steel or aluminum.

This low-cost Feik Winch can't corrode . . . will last for years. Rugged, yet precision-made. Minimum capacity, 800-lbs. direct lift. Available in 2 types, at quantity prices.

Solid Brass!

The most copied winch in America

PAT. PENDING

SEND FOR LITERATURE AND PRICES

W.G. FEIK *Marine Products*

Dept. W • 1809 Afton • Houston 24, Texas

30 YEARS AGO

(Taken from *The Welding Engineer* of July, 1925)

The original Kappertz Welding Works has recently been taken over by the Morristown Welding and Radiator Co., Inc. It will in the future be known under the new name.

—30 YEARS AGO—

The first annual picnic of the American Welding Society, Cleveland Section, was held on June 20th, and was attended by over 100 local welding celebrities.

—30 YEARS AGO—

Charles R. Sutton, formerly proprietor of the Sutton Welding Products Co., Indianapolis, and Henry I. Raymond, Jr., have recently formed the Sutton-Raymond Corp., 319 W. Maryland St., as dealers in welding equipment and supplies.

—30 YEARS AGO—

It is reported that business conditions in general and in the welding line in particular are improving in the Northwest. The United States Welding Co. of Minneapolis reports a 14-hour daily schedule for the past three months.

—30 YEARS AGO—

A featured article points up the claim of American manufacturers that "welded joints are better joints" and offers as proof reprints of current advertisements sponsored by D. D. Wessels & Sons Co., Detroit; Thorp Fire Proof Door Co., Minneapolis; and Grinnell Co., Providence, R.I.

—30 YEARS AGO—

J. F. Lincoln, vice-president of the Lincoln Electric Co., Cleveland, has just left on a business trip to England. During his stay, Mr. Lincoln will headquarter in London, visit the main industrial centers and study general business conditions.

—30 YEARS AGO—

Welding progress in Spain has been so satisfactory in recent years that the publication of a trade paper on welding has finally been justified. The name of the new paper is *La Soldadura Autogena.*

—30 YEARS AGO—

W. Strelow of Hamburg, Germany, describes in an article his theory that arc welding should replace riveting for sounder and more economical shipbuilding.

TILLMAN Gloves—Garments

WELDORS BUY FROM YOUR DEALER

ASK FOR OUR NEW CATALOG

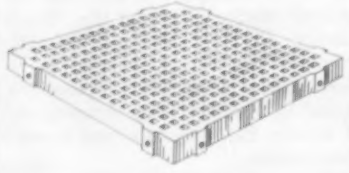
BRAZILIAN DEERSKIN THE "STAY SOFT" LEATHER GLOVES AND MITTENS

TILLMAN PRODUCTS
John Tillman & Co.
Long Beach, Calif.

WELDING and SET-UP PLATENS

(Shipyard bending block type)

Floor plates—bending tables—layout tables—straightening tables—dog blocks—bending blocks—blacksmith blocks. 5'x5'—6'x6'—6'x8'—6'x10' — 5'x10' — 6'x12' — 3'x3' — either 6" or 7" thick.



Weldments dogged down to these planed semi-steel blocks stay flat during fabrication.

Write for low cost details.

STAHL EQUIPMENT CO.
94 Washington St.
Brookline Village 46, Mass.

Meet your friends in Chicago

at the

NEW HOTEL

HAMILTON

in the heart of the loop

20 S. DEARBORN STREET

at MADISON

Check these Features

- √ VERY LOW RATES
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- √ A FAMILY HOTEL COME AS YOU ARE
- √ ONE BLOCK FROM STATE ST. SHOPPING
- √ A FEW BLOCKS FROM ALL ENTERTAINMENT
- √ 3 MINUTES FROM THE FINANCIAL DISTRICT
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- √ PARKING JUST A BLOCK FROM HOTEL—60¢ OVERNITE
- √ FREE CRIBS FOR THE BABIES—COTS FOR THE CHILDREN

ALL THIS

FROM **$4** SINGLE AND UP

Information — Reservations

Write

Samuel LEEDS, Pres.

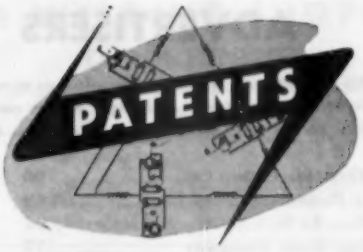
BOX 100

Hotel HAMILTON

20 S. DEARBORN ST.

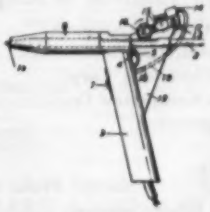
at MADISON

CHICAGO



Plastic welder

2,681,685. RICHARD S. ARKLESS, Billingham-on-Tees, England. Filed July 1, 1952. Granted June 22, 1954.



An improved plastic extrusion welding device is described in this patent. Simply constructed, it is comprised mainly of a tube adapted to contain the front portion of a length of thermo-plastic filler rod. Tapered in front to form a discharge orifice, the tube is slotted at the rear to expose a short length of the filler rod. A feeding member fitted in the slot is in constant, direct engagement with the filler rod. An electric heater coil winds around the tube's nozzle. There is a switch to control the heater coil.

* * *

Welding electrode holder

2,683,206. HARRY E. DAY, Huntington Woods, and EDWARD G. BIEDERMAN, Detroit, Mich. Assigned to Link Welder Corp., Detroit, Mich. Filed Nov. 17, 1952. Granted July 6, 1954.

A welding electrode holder, described in this patent, includes a mounting plate, means for connecting a cable to the mounting plate and a welding tip adapter of generally elongated shape. The tip adapter has means at one end adapted to receive a welding electrode tip and means within the tip adapter for conducting a coolant to and from the tip. A fluid connection on the side of the tip adapter carries the coolant. A portion on the mounting plate receives the tip adapter and means carried by the mounting plate. It is movable between a releasing position in which the tip adapter is supported for free rotation by the mounting plate. A securing position in which the tip adapter is immovably held by the mounting plate, whereby the fluid connection is adjustably held in a desired angular position.

"Red Head"

WELDING CLAMPS

- Designed for Welding
- No Threads To Damage

1. Case hardened threads are always protected from weld spatter and never exposed to damage in open or closed position.

2. The clamp body is cut from solid plate, thereby insuring extreme rigidity and giving great resistance to bending or twisting.

3. Heat treated chrome molybdenum alloy handle offers great resistance to bending.

23 stock sizes

CHICAGO BOILER COMPANY

1968 CLYBOURN AVENUE

CHICAGO 14, ILLINOIS

Make More Money on EVERY Welding Job..

METAL BOND

SOLDERING AND WELDING

PRODUCTS

We have been making Metal Bond Products for more than 25 years and successful Welders all over the country have been using them to advantage.

AIDS TO GOOD WELDING JOBS

• Tinning Compounds • Soldering Salts • Hard Metal • Aluminum Solder • Mouldough • Brazing Flux No. 10 • Special No. 31 • Seal-X-O • Cast Iron Welding Flux No. 4 • All Steel Wire Brushes and Holders.

• Make your own test—also send for our pocket-size catalog which contains information and descriptions of our money-saving METAL BOND Products.

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MONTGOMERY CITY, MO.

P.O. BOX 215

Insist on famous "Jorgensen" AND "Pony"

CLAMPS

Ask your supplier

SEND FOR FREE 32-PAGE CATALOG.

ADJUSTABLE CLAMP CO.

"The Clamp Folks"

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CAST IRON

No. 1 WELDING FLUX

Acts as a cleansing agent—removes all impurities in the metal at the weld—prevents formation of oxide—eliminates blow holes—maks possible a better granular, softer, more ductile structure in the weld. Starts melting at 1150°—completes: 1275°.

ALSO

2—Brazing Flux for Brass, Bronze, etc.
3—Brass, Bronze Welding Flux
4—Flux for Bronze Welding Cast Iron
5—Extra Quality Aluminum Flux
7—Steel Flux
8—Aluminum Flux
9—Stainless Steel Flux
11—Tinning Compound
12—Burnt Cast Iron Welding Flux
13—Brazing Flux for Extruded Bronzes
14—Special Brazing Flux for Aluminum Bronze, Everdur, and all Silicon Bronzes
15—Special Flux for Magnesium Alloys, Dow Metal, etc.
16—Silver Solder Paste Flux

Profit by the Use of One or More of These Products

Choose the one best suited to your needs and order by number. All ANTI-BORAX Products guaranteed. Send for circular and free sample.

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FORT WAYNE, INDIANA

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Weld-O-Vent

"World's Finest Exhaust Systems"

Welding Fume Exhausters

MANY EXCLUSIVE FEATURES

- Portable and stationary units for all applications.
- Unlimited flexibility, fast, easy positioning, over 360° radius.
- Blowers can be attached to units or mounted at remote points connecting with ductwork.
- Units can be connected in series.

High Velocity Hood Quickly Removes Smoke and Fumes.

Available in 9, 12, or 16 feet reach units.

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Weldment Fabricator located in State of Connecticut wants SUPERVISOR who knows weldment fabrications of all kinds and who has the ability to work out operating improvements. Right man can eventually qualify for plant superintendent job. Write full details of experience and salary desired to Box 753, WELDING ENGINEER, 12 E. Grand, Chicago 11.

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WELDING—A profitable trade. Demand for trained men. Learn quickly at best equipped school in U.S. Non-profit. G. I. approved. Catalog free. Write Hobart Welding School, Box U-751. Troy, Ohio.

EQUIPMENT FOR SALE

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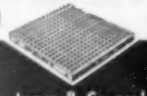

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901 N. Delaware Ave. Phila. 23, Penna.

HELIARC EQUIPMENT

offered at unusually low prices for quick clearance

- Heliarc Cable hose for HW4 (25) HW8 part Number 55Y72 ..... **$9.00** each
- Argon water shut-off valve type V30–16 x 21 ..... **$12.50** each

In original packing and brand new. Minimum shipment 25 items.

On orders of 50 items a 10% deduction from above quoted prices is allowed. This is a limited supply and subject to prior sale—and sold F.O.B. Seattle.

Terms: Net 10 days to D and B rated accounts, others sent C.O.D. or upon receipt of check.

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Monel, Type 130, 5/32"
Monel, Type 130, 3/32"
Inconel, Type 132, 5/32"
Inconel, Type 140, 3/32"
Stainless Steel (Raco), Type 308 L, ⅛"
⅛" Metco Copper (Metallizing Spra-Copper Wire)
Miscellaneous Welding Material, Tweco Electrode Holders, Heliarc Electrodes, Welding Clamps, etc.

Send for itemized list

ARRO EQUIPMENT CO.

Phone 4-7443 P.O. Box 256 Knoxville, Tenn.

CUTTING MACHINES, AIRCO Camo & Radiographs, Nat. S's Harris K's.
SEAM WELDER, Progressive, 150 KVA, New.
SPOT WELDER, National, 40 KVA, Used.
CUTTING TORCHES, Used, Oxweld, Airco, Harris.
WELDING TORCHES, New, Rego GV.
BRONZE—STAINLESS—AMPCOTRODES.
NO. 12 LENSES, ELECTRODE HOLDERS.
RALL SUPPLY CO. 51 E. 42nd St., N.Y.C. 17

LATEST: 1946 to 1951

227 KVA Progressive spot welder, air operated, 440 volts
150 KVA Precision spot projection, Weltronic controls, 440 volts
15 KVA Banner spot welder, 220 volts, air operated, timer
10 KVA Taylor-Winfield spot welder, 220 volts, foot operated.
200 and 400 amp. Wilson Hellweld Bumblebee arc welders for stainless steel and aluminum
300 amp. G.E. arc welder, 200 volts
Unionmelt automatic seam welder

ESTES MACHINERY CO.

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MOnroe 6-1814

IN 100-LB. LOTS, F.O.B. SCRANTON
SALE OF SURPLUS ELECTRODES
AMPCO-TRODE, 3/16" x 14" No. 19 Aluminum Bronze Coated D.C. Electrodes in Good Condition—25 lb. Cartons—50c lb.
SCRANTON WELDING SUPPLY COMPANY
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INDUCTION HEATER Demonstrator

3½ kw Scientific Electric induction heater for heat treating, brazing and soldering, 220 v, 1 phase, 450 kc operating frequency. Was $1135.00. Sale price $795.00. F.O.B. Wheeling, Ill.

MYKROY, INC.

Wheeling, Illinois

Phone Wheeling 280

Interested In Purchasing Any Quantity of:

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60 cu. ft. oxygen cylinders
122 cu. ft. oxygen cylinders
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Made of brightly colored duck, sanforized and washable. Retail price $1.00 each. Order a trial dozen. Satisfaction guaranteed.

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A NICE REPEAT BUSINESS

JOBBERS WANTED IN EVERY CITY TO SELL "WELDER'S PAL" EYE DROPS

On the market for 20 years

CARHOFF COMPANY
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No charges or C.O.D.—cash with order postpaid.
WELDING ENGINEER
12 E. Grand Ave., Chicago 11, Ill.

free literature . . . . . USE CARD ON OPPOSITE PAGE

51. FLAME-CUTTING—Arcair Co. Booklet gives basic rules for efficient flame-cutting with hand cutting torch. For use on mild steel with oxygen and acetylene gases.

52. INSPECTION—Turco Products, Inc. 12-page booklet "Flaw Location by Dye Penetrants" describes inspection method for metals.

53. CUTTING MACHINE—The Burdett Oxygen Co. Catalog sheet gives details of new portable lightweight cutting machine "Burdox Beaver."

54. DIODES—International Rectifier Corp. "Bulletin GD-2" lists ratings and specifications on germanium diodes.

55. ALLOY SELECTOR—Anchor Metal Co. Alloy Selection Chart contains useful information on various alloy melting points, beginning with the fusible up to the silver brazing alloys.

56. INDUCTION HEATING—Lepel High Frequency Laboratories, Inc. 36-page catalog illustrates induction heating units and work handling equipment.

57. PYROMETER — The Pyrometer Instrument Co., Inc. Illustrated folder discusses models of "Pyro" surface pyrometers available and their wide industrial applications.

58. ABRASIVES—Weldon Roberts Rubber Co. Catalog lists line of rubber-cushioned abrasives.

59. WELDOR AID—Eutectic Welding Alloys Corp. 16-page "Rod Finder Guide" TIS 1126 is helpful source for proper rod, flux and electrode.

60. WELDING NEWS — Ampco Metal, Inc. First quarter issue of *Welding News* features articles on uses of electrodes.

61. HELMET—Mine Safety Appliances Co. 16-page brochure describes line of "Skullgard" protective helmets.

62. HARDFACING—Haynes Stellite Co. Leaflet "It Pays to Use Good Hard-Facing Rods" discusses advantages of better-grade rods.

63. ADHESIVES—Minnesota Mining & Mfg. Co. Illustrated 4-page folder gives uses of "3M" adhesives, coatings and sealers for sealing and bonding sheet metal.

64. WELDING—Metal & Thermit Corp. 32-page manual "A New Welding System" is guide to welding chromium-molybdenum steels with "Murex Croloy" electrodes.

65. LIGHTER—Modern Engineering Co., Inc. Folder illustrates and gives details of "Tripl-Flint" safety lighter.

66. WELDOR'S CLOTHING—John Tillman & Co. Catalog describes line of weldor's protective clothing and accessories.

67. WELDING WIRE—Drawalloy Corp. 4-page illustrated folder presents prices and details of stainless steel welding wire.

68. ACETYLENE CYLINDERS — Coyne Cylinder Co. Folder gives specifications of acetylene cylinders available.

69. ELECTRODE HOLDER—H. J. Wagner Products, Inc. Illustrated bulletin gives specifications and prices of electrode holders and ground clamps.

70. WELDING HELMETS—Kedman Co. Catalog No. 4 describes models of "Huntsman" welding helmets and visors.

71. WELDING MACHINE—Expert Welding Machine Co. Illustrated bulletin EW-3 gives details of new line of resistance welding machines for wide variety of spot and projection welding operations.

72. GOGGLES—Welsh Mfg. Co. Sheet depicts new weldor's spectacle goggles.

73. WELDING DATA—Air Reduction Sales Co. 16-page "Publication List" briefly describes available reprints, booklets and movies.

74. ALLOY CHART—Precision Metalsmiths, Inc. "Chart of Standard Investment Casting Alloys" is guide for selection or specification of such alloys.

75. STEEL DICTIONARY—LaSalle Steel Co. Bulletin No. 6 "Simplified Steel Terms & Engineering Data" is dictionary of steel terms and processes.

76. ARC WELDERS—Royal Arc Industries, Inc. Folder describes new welder-generator combination for wide variety of applications.

77. WELDING EQUIPMENT — Modern Engineering Co. Illustrated folder discusses lighters, welding and cutting torches, and regulators.

78. ARC WELDING—Erico Products, Inc. Catalog describes cable connectors, electrode holders and other accessories.

79. SPARK LIGHTERS—G. C. Fuller Mfg. Co. Catalog No. 103 illustrates and describes various spark lighters.

80. RECTIFIERS — Brance-Krachy Co., Inc. Illustrated catalog discusses features of selenium rectifiers.

81. RESISTANCE WELDING — Sciaky Bros., Inc. Vol. 4 No. 6 "Resistance Welding at Work" gives case histories of applications of the process.

82. ANTI-SPATTER COMPOUND—York Engineering Co. Catalog sheet gives details of liquid Compound 106.

83. ABRASIVE—C. R. Vogt & Co. Abrasive wheel described on catalog sheet is designed for grinding, sanding, polishing and deburring.

84. FILTER—U. S. Hoffman Machinery Corp. Bulletin HH 103 explains operation of self-cleaning pressure filter designed to remove sludge formed by dissolving electrodes.

85. NICKEL RESISTANCE — International Nickel Co., Inc. Bulletin T-6 reports on resistance of nickel and its alloys to corrosion of caustic alkalies.

86. ELECTRODE—Mir-O-Col Alloy Co., Inc. Folder describes 3S electrode, highly alloyed for shatterproof deposit.

87. WELDER — Automatic Welding Co. Literature discusses new multiple-spindle, submerged-arc welding fixture able to handle six types of tractor steering spindles.

88. TRANSFORMERS — Associated Research, Inc. 4-page bulletin 365-1 describes and illustrates "Donut" type current transformers for metering applications.

89. ABRASIVE MACHINING—Engelberg Huller Co. "Abrasive Belt Machining" is 23-page catalog describing application methods of complete line of abrasive belt machines.

90. ABRASIVE STORAGE — Armour & Co. "How to Store Coated Abrasives" is 8-page illustrated booklet detailing temperature and humidity limits for proper storage of coated abrasives, with suggestions for ideal storage room location.

91. PYROMETER DATA — The Bristol Co. 56-page bulleting P1238 contains data on selection and installation of thermocouples and pyrometer accessories.

92. AUTOMATIC WELDING — Pandjiris Weldment Co. 6-page cost analysis of automatic arc welding seams of cylindrical and elliptical vessels or pipe covers 10 gage to ¾ in. plate.

93. INDUSTRIAL X-RAY—E. I. Du Pont De Nemours & Co. Booklet on industrial radiography discusses available X-ray films including data on proper use.

94. STAINLESS VALVES—Cooper Alloy Corp. Catalog No. 55 "Valve Technical Data" is 12-page booklet on stainless steel valve design, selection, maintenance and repair.

95. TUBING STEELS—The Babcock & Wilcox Co. Bulletin TDC 177 lists chemical analyses of standard carbon, alloy and stainless tubing steels used in elevated temperature and pressure service.

96. TITANIUM MACHINING — Mallory-Sharon Titanium Corp. "Machining Recommendations for Titanium" is based on fabrication experience and research studies, gives aids for machining titanium and its alloys.

97. AUTOMATIC WELDER — Pandjiris Weldment Co. Bulletin "RBM-1" describes automatic manipulator on a moveable base for use with different welding speeds. The unit is available with special or standard welding head pilot.

98. REGULATORS—Oxo Welding Equipment Co. Illustrated 12-page catalog No. 55 describes several types of gas regulators available. Nozzle unit is said to allow quick and easy replacement of vital internal parts.

99. CENTER-FINDER — Interstate Sales Co. Illustrated sheet gives detailed description of model "PF-3M" center-finder protractor. Instrument is said to enable marking four equi-distant points on any size pipe-circumference at any degree at the same time.

100. WELDING ACCESSORIES — Har-Worth Mfg. Co. Illustrated catalog sheet details ground clamps, cable connectors, connections and other supplies currently available.

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USE THIS CARD for Literature, Catalogs, and Bulletins shown on facing page, and for those featured in this month's ads as listed on next page

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(Advertisers' Literature)

149. Victor Equipment Co.—Catalog 20 describes flame torches and accessories.
150. Westinghouse Electric Corp.—Information on "RA" d-c welder with 3-phase rectification for arc stability.
151. Westinghouse Electric Corp.—Literature on "TA" a-c welder with 80-volt open circuit.
152. Westinghouse Electric Corp.—Data on constant-potential rectifier machine.
153. Worthington Corp. — Bulletin 1700811 describes various welding positioners.

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literature offered in advertisements in this issue:

101. Adjustable Clamp Co.—32-page catalog describes all types of clamps.
102. Air Reduction Sales Co.—Catalog #1318 serves as pocket guide for proper electrode selection.
103. Air Reduction Sales Co.—Literature on electrodes, holders and d-c rectifiers for arc welding.
104. Alloy Rods Co.—Complete story on iron powder, low hydrogen electrode.
105. American Brass Co.—Publication B-13 describes welding rods.
106. American Optical Co.—Catalog on safety products.
107. Amperex Electronic Corp.—Data on thermostatic control of ignitron tubes.
108. Anti-Borax Compound Co., Inc.—Circular and sample of solder and brazing compounds and fluxes.
109. Bridgeport Brass Co.—New Booklet entitled "Bronze Welding, Modern Tool of Industry."
110. Carborundum Co.—Information on grinding wheels and abrasive products.
111. Chicago Eye Shield Co.—Literature on welding helmets and other safety products.
112. Contour Marker Corp.—Data on various contour-marking devices.
113. Detroit Testing Machine Co.—Information on hydraulically powered tensile tester.
114. Dockson Corp.—Complete catalog of welding and cutting equipment.
115. Drawalloy Corp.—Information and prices on stainless steel welding wire.
155. Engwald Corp.—New data on welding fume exhauster.
116. W. G. Feik Marine Prods.—Literature and prices on non-corrosive brass winch.
117. General Electric Co.—Bulletin GEA-6243 on new a-c welder with ratings up to 500 amp. and high open-circuit voltage.
118. Goldsmith Bros. Smelting & Refining Co.—Data book gives complete information on low temperature silver brazing.
119. Handy & Harman—Bulletin 20 gives pointers on joint design and time-labor-cost-saving brazing production methods.
120. Harnischfeger Corp.—Brochure on welding positioners.
121. Harris Calorific Co.—Descriptive folder No. 540710 on flame torch designed for intense heat use.
122. Har-Worth Mfg. Co.—Literature and prices on electrode holders, clamps, connectors, terminals and circle burners.
123. Haynes Stellite Co.—Booklet contains descriptions and procedures for applying hard-facing alloys.
124. Hobart Bros. Co.—Vest-pocket welding guide.
125. Hobart Bros. Co.—Catalog on new simplified arc welders.
126. Hobart Bros. Co.—Catalog lists and describes various types of electrodes.
127. International Nickel Co.—Booklet on cast-iron welding.
128. Kasson Die & Motor Corp.—Folder on portable 200 amp. arc welder.
156. Krembs & Co.—Chart and sample of "Fluxine" available.
129. Lincoln Electric Co.—Bulletin 1343 on a-c/d-c welder.
130. Lindberg Engineering Co.—Bulletin No. 1460 assists in solving metal heating problems.
131. Linde Air Products Co.—Booklet F-8684 on flame torch welding and heating jobs.
132. Liquid Carbonic Corp.—Details and prices on balanced-pressure regulators.
133. P. R. Mallory & Co.—Resistance welding catalog helps choose proper electrode holders.
134. Metal Bond Mfg. Co.—Pocket-size catalog describes soldering, brazing and welding products.
135. Metal & Thermit Corp.—Information on new chrome-moly electrodes.
136. Miller Electric Mfg. Co.—Complete data on selenium rectifier and other arc and spot welders.
137. Norris-Thermador Corp.—Information on acetylene cylinders.
138. Page Steel & Wire Div.—Detailed literature and prices on welding wire.
139. Rankin Mfg. Co.—Cut-away template (Form A-7) for measuring wear of rails, sprockets, idlers, etc.
140. Rankin Mfg. Co.—Form A6-1 gives specifications for tractor rollers and idlers.
141. Sellstrom Mfg. Co.—Information on ventilated welding goggles.
142. A. O. Smith Corp.—Booklet describes gas shielded metal arc process that uses carbon dioxide.
143. Stahl Equipment Co.—Details on welding and set-up platens.
144. Stulz-Sickles Co.—Detailed specifications on "Manganal" hot rolled plates.
145. Sylvania Electric Prods., Inc.—Technical information on tungsten electrodes for inert gas welding.
146. Tillman Prods.—Catalog lists welding gloves, mittens and other garments.
147. Torit Mfg. Co.—Catalog on dust collectors for various jobs and machines.
148. United Wire & Supply Corp.—Folder on "Phoson" for copper and other low temperature brazing.
154. Vickers Electric Co.—New bulletin on magnetic amplifier-rectifier d-c welder.

(More ad literature on preceding page)

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